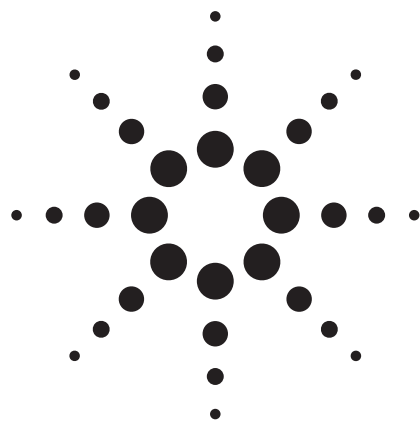


**Agilent E6474A**  
**cdmaOne/cdma2000/1xEV-DO**  
**Wireless Network**  
**Optimization Platform**

Data Sheet



**Agilent Technologies**

The Agilent Technologies E6474A Network Optimization Platform is a scalable, integrated, air interface measurement system. This system is used to support integration and maintenance of networks, obtaining comprehensive call performance measurements and quantifying the end-user's experience for both voice and data. The system includes extensive cdmaOne, cdma2000 and 1xEV-DO measurements as described in this document. Depending on the selected hardware options, the E6474A system can make measurements on various frequency bands including cellular band, PCS band, JCDMA band, KCDMA band and IMT band. A PC interfaces to a maximum of four mobile devices and 4 digital receivers for simultaneous data, trace and network independent receiver measurements. System software controls the phones to make and record user selected cmda2000 and 1xEV-DO measurements and phone overhead messaging.

The Agilent CDMA digital receiver can be used in conjunction with the E6474A allowing correlation of RF and phone measurements. A GPS receiver, which is integral to the Agilent receivers, used to obtain positioning information that is collated with the measurement results. The system can also be configured for use with a pen tablet computer for indoor measurements without GPS. Logged data can be exported to mapping software for analysis.

## **About this document**

This document gives detailed information on features accessible on the E6474A cdmaOne, cdma2000 and 1xEV-DO drive test system and associated software and hardware options.

## **cdmaOne, cdma2000 and 1xEV-DO Overview**

### **System Software**

The E6474A system software is a user-friendly Microsoft Windows-based application designed to reside on a laptop. Through a selection of licensing options it is possible to configure the software to provide cdmaOne, cdma2000 and 1xEV-DO phone-based measurements, CDMA receiver based measurements and wireless data measurements. With the multiple phone measurements license it is possible for the system to control up to four test mobile phones simultaneously (two for simultaneous data and trace). It is possible to expand your system at any time by adding software licenses or hardware to the base product. Multiple measurements can be made simultaneously. All the measurements can be displayed in real-time and logged to a database. Indoor measurement capability, without the need for GPS navigation, can be added by selecting the indoor measurements software license option. Refer to the E6474A Wireless Network Optimization Platform configuration guide, literature number 5988-2396EN, for detailed option information.

## **E6474A Wireless Network Optimization Platform cdmaOne, cdma2000 and 1xEV-DO options**

- Option 010: multiple mobile device software license
- Option 030: indoor measurement software license
- Option 070: TechTool – RF data and GPS logging
- Option 071: TechTool – alarming capability
- Option 072: Tech Tool – CDMA/cdma2000 CAI messaging
- Option 090: E74xx to E6474A software upgrade
- Option 100: cdmaOne mobile phone measurement software license
- Option 101: cdma2000 mobile phone measurement software license
- Option 111: cdma2000 receiver measurement software license
- Option 120: combined cdmaOne receiver and mobile phone measurement software license
- Option 121: combined cdma2000 receiver and mobile phone measurement software license
- Option 126: cdmaOne to cdma2000 phone measurement software license upgrade
- Option 130: cdmaOne TechTool software license
- Option 131: cdma2000 TechTool software license
- Option 135: cdma2000 to 1xEV-DO AT measurement software license upgrade
- Option 136: cdma2000 to 1xEV-DO receiver measurement software license upgrade
- Option 700: cdma2000 data measurement client software license
- Option 710: cdma2000 data measurement server software license
- Option 740: Wireless Application Measurement Software (WAMS)

**NOTE:** The cdma2000 Licenses provide access to cdmaOne measurements.

### **Measurement software**

The system software allows phone measurements with a single mobile phone or wireless PC Card with software license E6474-100, 101, 120 or 121. If multiple phone control is required, Option 010 adds multiple device capability to Options 100, 101, 120 or 121 for control of up to four mobiles for multiple user scenarios or for benchmarking of two or more networks.

Option 126 is a cdmaOne to cdma2000 phone measurement upgrade for those with an existing Option 100 or 120 CDMA phone measurements software license.

Option 131, the cdma2000 TechTool software license, is a subset of the phone-based software license that allows the user to view measurements real-time; however, the TechTool software license does not include alarms, the ability to view layer 3 messaging, and the ability to record data.

Option 135 is a cdma2000 to 1xEV-DO phone measurement upgrade for those with existing Option 101 or 121 cdma2000 phone measurement software licenses.

Options 070, 071 and 072 adds logging capabilities, alarming, and Layer 3 messaging, respectively, to the option 131 TechTool software license.

Options 700 and 710 client server software provides generic data test capability for any technology. These two software licenses provide the ability to send know data types and make throughput and BER measurements. Option 740 provides application layer wireless data test measurement capability that works in coordination with the RF measurements to give the user insight into both the RF and Core network environments.

## **cdmaOne and cdma2000 Measurement Views**

A number of different views are available from the view menu to enable the display of measured or calculated data. The views should be arranged within the main window before starting data collection or testing, although they can be opened and closed during a test. This section gives details of the views associated with:

- cmdaOne phone measurements
- cdma2000 phone measurements
- 1xEV-DO phone measurements
- cdmaOne/cmda2000/1xEV-DO receiver measurements

Common platform measurement features will be discussed in a subsequent section.

## Phone Based Measurements

The E6474A software provides phone or PC Card based measurements for cdmaOne, cdma2000 and 1xEV-DO handsets or wireless PC Cards and is fully backward compatible with IS-95 handsets. The E6474A phone based measurements options provide 3 primary elements:

- Call setup
- Phone measurements
- Layer 3 messaging

### Call setup

Call setup is divided into two main pieces —dialing setup and log mask setup. The appropriate control view for the dialing and log mask setup can be accessed by right-clicking on the specific device within the System Setup view. This will bring up the CDMA Properties view. For cdma2000 the CDMA Properties view has five tabs as follows: Autodial Setup, Dip Switches, Log Mask, CDMA2000 Log Mask and Enables.

### Autodial setup

The dialing setup is divided between the autodial setup tab view and the dip switches tab view within the CDMA properties view. The autodial setup provides automated control of the handset. The Autodial Setup view provides the functions listed below.

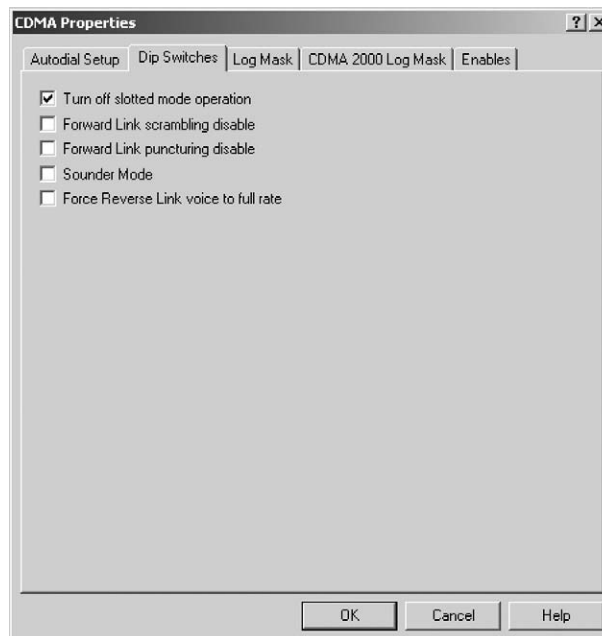
The screenshot shows the 'CDMA Properties' dialog box with the 'Autodial Setup' tab selected. The dialog has a title bar with a question mark and close button. Inside, there are five tabs: 'Autodial Setup', 'Dip Switches', 'Log Mask', 'CDMA 2000 Log Mask', and 'Enables'. The 'Autodial Setup' tab contains several settings: 'AutoDial' and 'Call Statistics' are checked; 'Immediate Dial' is checked and 'Continuous Call' is unchecked; 'Call Type' is set to 'Default'; 'Call Duration' is 40 secs; 'Idle Time' is 10 secs; 'Call Setup' is 10 secs; 'Call Number' is 5551234; 'MOST Test' has 'Conduct MOST Test' unchecked and a 'Most Parameters' button; 'Call Scripting' has 'Use Call Scripting' unchecked and a 'Call Scripting' button; 'Averaging' has 'Num Of Frames For FER Rolling Average' set to 500 and 'RLP Throughput Rolling Avg Window' set to 1. At the bottom are 'OK', 'Cancel', and 'Help' buttons.

- AutoDial – enables automatic dialing
- Call Statistics – logs attempted calls, blocked calls, dropped calls
- Automatically Set PC Clock – automatically sets PC clock to GPS timer
- Immediate Dial – if a call is dropped, the next call will be placed after waiting for the specified idle time
- Continuous Call – enable this check box to make one continuous call during a test -- to end the call, end the test
- Call Type pick list
  - Default
  - EVRC

- Loopback (13k)
- Loopback (IS-126)
- Markov (13k)
- Markov (8k)
- Markov (old 8k)
- TDSO
- Voice (13k)
- Voice (IS-96)
- Voice (IS-96A)
- Call Duration – length of the call
- Idle Time – time between calls
- Call Setup – maximum time allowed to make the connection
- Number to call – for a digital phone, enter the number to be dialed. For an analog phone, enter the speed-dial memory location that contains the number to be dialed. In answer mode, enter the phone number of the phone being called.
- MOST Testing – the MOST testing view is designed to automate base station testing within the Lucent infrastructure
- Call Scripting – this lets you input a sequence of different voice calls to be made
- FER Averaging

This option allows you to select how many frames are used in the rolling average used in determining the FER. The range of values is 50 to 500

## Dip switches



The following options can be chosen within the dip switches tab :

### Turn off slotted mode operator

- if checked, continuous monitoring of the paging channel will occur (default)
- if unchecked, monitoring in slotted mode occurs

### Forward Link Scrambling Disable

- if checked, no calls can be placed or received, because the phone does not decode the paging channel
- if unchecked, the phone operates normally

### Forward Link Puncturing Disable

- if checked, the phone's Tx power will not vary as the BTS transmit power decreases, because the phone stops decoding the power control bit
- if unchecked, the phone operates normally

#### Sounder Mode

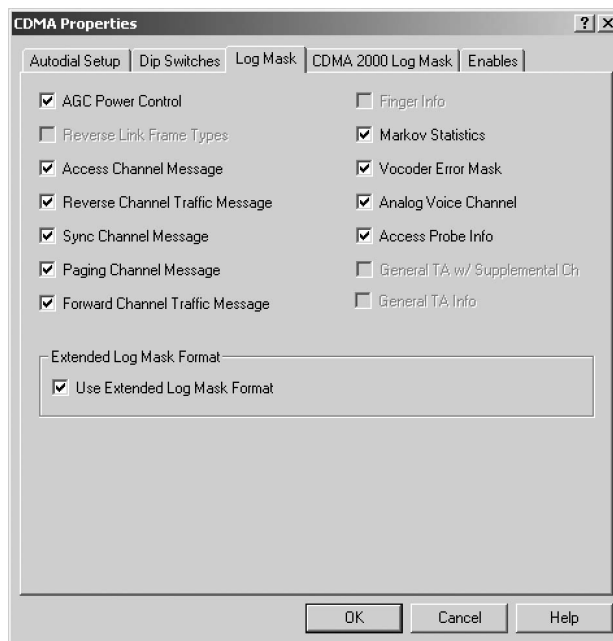
- if checked, after the first call is placed and ended, only Sync channel messages will be received – no further calls can be placed or received
- if unchecked, the phone operates normally

#### Force Reverse Link Voice to Full Rate

- if checked, transmit vocoder rates are set to the full rate, regardless of the voice activity
- if unchecked, the phone operates normally

### Log mask

The E6474A system extracts measurement data from the mobile handset. Extraction of the specific measurement type is controlled by a set of check boxes within the log mask tab, cdma2000 log mask tab and enables tab within the CDMA Properties view for the mobile phone.



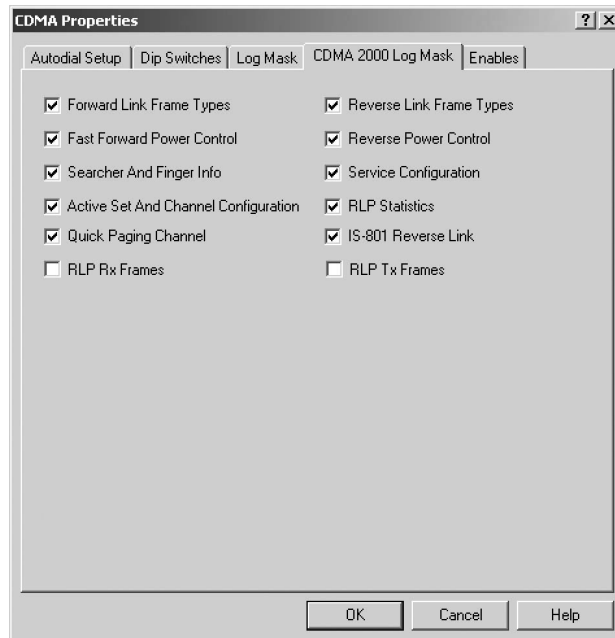
The log mask tab enables the logging of the following items:

- AGC Power Control – power control messages
- Access Channel Message – all access channel signaling messages sent
- Reverse Channel Traffic Message – all reverse Traffic Channel signaling messages sent
- Sync Channel Message – all Sync Channel Messages sent
- Paging Channel Message – all Paging Channel signaling messages received
- Forward Channel Traffic Message – all Forward Traffic Channel signaling messages received
- Use Extended Log Mask Format check box. This option must be checked in order to retrieve cdma2000 log mask items. This option also enables the streaming message option of the phone. Keep this option checked while collecting data with any cdma2000 phone or PC Card



- Markov Statistics – Markov rate and error data
- Vocoder Error Mask – vocoder rate and data with bit errors detected
- Analog Voice Channel – analog mode data – SID, Channel, RSSI, etc.
- Access Probe Info – Sequence Number, Probe Number, Receive AGC, Tx Gain Adjust, etc.

## cdma2000 log mask



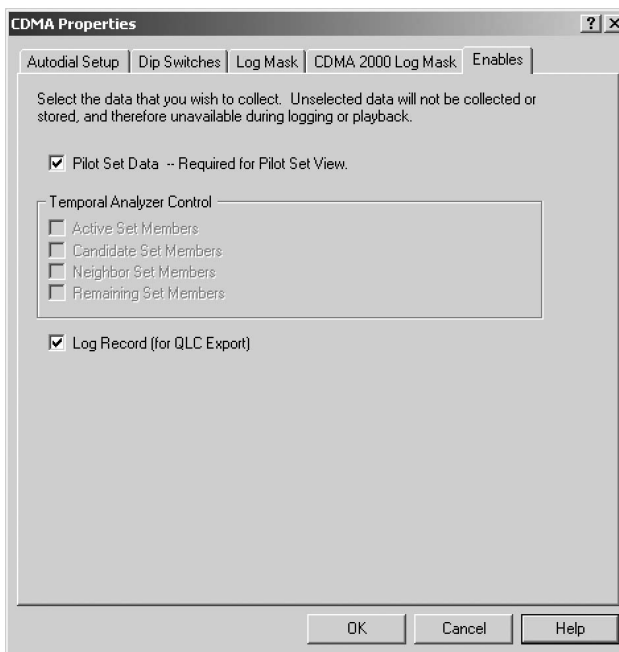
The cdma2000 log mask tab enables the logging of the following items:

- Forward Link Frame Types
- Reverse Link Frame Types
- Fast Forward Power Control
- Reverse Power Control
- Searcher And Finger Info
- Service Configurations
- Active Set And Channel Configurations
- RLP Statistics
- Quick Paging Channel
- IS-802 Reverse Link
- RLP Rx Frames
- RLP Tx Frames

**Important:** The Use Extended Log Mask check box must be checked on the Log Mask tab to have the ability to log cdma2000 data.

## Enables

The Enables tab allows you to select the data to be collected and displayed in the Pilot Set and Temporal Analyzer views. Unselected data items will not be collected or stored, and therefore will not be available for playback or analysis.



### Pilot Set Data

Enables collection of pilot set data for display in the Pilot Set view. Log data is not affected by the setting of this check box.

### TA (Temporal Analyzer) Control

Select the Pilot Set Members that you want to log. The pilots that are checked can also be displayed in the TA Graph view. The choices are: Active, Candidate, Neighbor, and Remaining set members.

**Note:** Searcher Information 2 messages are only collected for the Pilot Set Members that are enabled. If no Set Members are enabled, no Searcher Information 2 messages will be collected.

Log Record (for QLC Export) when checked logs the Qualcomm® binary files to the E6474A database for export to post processing tools.

## cdmaOne/cdma2000 Phone Views

The logged phone measurements made by the E6474A system can be seen within several phone measurement views. The views that show CDMA/cdma2000 phone measurements are:

- CDMA Frame Error Rate
- CDMA IS-95B SCHInfo (supplemental channel info)
- CDMA Layer 3 Messages
- CDMA Lucent MOST
- CDMA Markov Statistics
- CDMA Phone Status
- CDMA Physical Layer Info
- CDMA pilot sets
- CDMA Power Control
- CDMA Quick Paging channel
- CDMA Rx and Tx Vocoder
- CDMA RxTx Power
- CDMA Signal Quality
- CDMA Signal Strength
- CDMA Signal Strength
- Active PN
- CDMA TA Graph
- CDMA Tx Gain Adj
- cdma2000 PC\_PL
- cdma2000 RLP Info
- cdma2000 RLP Statistics
- cdma2000 SCH Info (supplemental channel info)
- cdma2000 SCH\_FCH
- cdma2000 Service Configurations
- Call Statistics

### CDMA Physical Layer Info

The screenshot shows a window titled "CDMA Physical Layer Info" with two main sections: "Fwd Chnl" and "Rev Chnl". Each section contains a "Phy Bit Rate" field with a "bps" unit, and a table of performance metrics for FCH, SCH 0, and SCH 1. The metrics include Frames Rcvd, Frames In Error, Error Rate, and Frame Rate.

Fwd Chnl			
	FCH	SCH 0	SCH 1
Phy Bit Rate:			
Frames Rcvd:			
Frames In Error:			
Error Rate:			
Frame Rate:			

Rev Chnl			
	FCH	SCH 0	SCH 1
Phy Bit Rate:			
Frames Rcvd:			
Frame Rate:			

This view displays frame error rate information for the forward and reverse channels. For the Forward link fundamental channel (FCH), supplementary channel 0 (SCH0), and

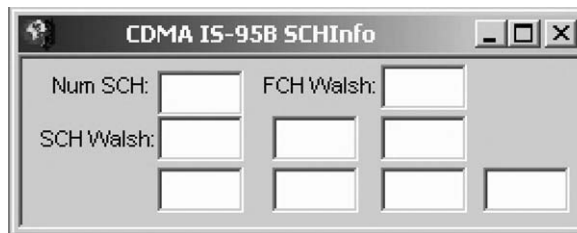
supplementary channel 1 (SCH1), the following values are listed:

- Frames Rcvd – the number of frames received
- Frames in Error – the number of frames received for which errors occurred
- Error Rate – the percentage of errors calculated as the total number of Frames in Error divided by the total number of frames received
- Frame Rate – The number of frames received per second between each update for FCH, SCH0, and SCH1

For Reverse link the following values are displayed for the fundamental channel (FCH), supplemental channel 0 (SCH0) and supplemental channel 1 (SCH1):

- Frames Rcvd – the number of frames received
- Frame Rate – The number of frames received per second between each update for FCH, SCH0, and SCH1

### **CDMA IS-95B supplementary channel info view**

A screenshot of a software dialog box titled "CDMA IS-95B SCHInfo". The dialog box has a standard Windows-style title bar with a minimize button, a maximize button, and a close button. The main area of the dialog box contains several input fields. On the left, there are two labels: "Num SCH:" and "SCH Walsh:". To the right of "Num SCH:" is a single input field. To the right of "SCH Walsh:" are three input fields arranged in a row. Further to the right, there is a label "FCH Walsh:" followed by a single input field. Below the "FCH Walsh:" label and its input field, there are three more input fields arranged in a row. The dialog box has a light gray background and a dark gray border.

This view displays the Walsh code for the fundamental channel and up to seven supplementary channels. It displays the following:

- Number of supplementary channels
- Channel Walsh codes
  - Fundamental
  - Supplemental

## cdma2000 Supplemental Channel Information view

The screenshot shows a window titled "{#3} CDMA2000 SCH Info". It contains the following fields and sections:

- Band Class: 1.8 To 2 GHz PCS
- Num Pilots: 3
- CDMA Chnl: 375
- Two columns for SCH-0 and SCH-1 with fields for Fwd Rate, Rev Rate, and Rev Walsh.
- An "Active Set Info" section containing a table of Walsh ID's.

Walsh ID's			
PN	FCH	DCCH	SCH
495	44		
294	63		
213	57		

This view displays the following cdma2000 phone parameters:

- Band Class
- Number of Pilots
- CDMA Channel

The following rate multiplier information is also displayed for Supplementary Channels 0 and 1:

- Forward rate
- Reverse rate
- Reverse Walsh cover

### Active Set Info

The Active Set Info provides:

- PN
- FCH
- DCCH
- SCH

## CDMA Lucent MOST view

The CDMA Lucent MOST view is designed to automate base station testing within the Lucent infrastructure and allows you to:

- Measure the quality of certain base station signals
- Automate access to these signals
- Record and report measurement results

## CDMA Markov Statistics view

This top section of this view displays the following information:

- Mode – type of Markov call being placed
- State – the current state of the mobile phone
- Markov Rate – the Markov processing rate (1/8, 1/4, 1/2 or Full)
- Total Frames – total number of frames received for each call
- Bad Frames – total number of bad frames received for each call
- Error Rate – the calculation of bad frames divided by total frames
- Bit Error – the total bit error count for each call

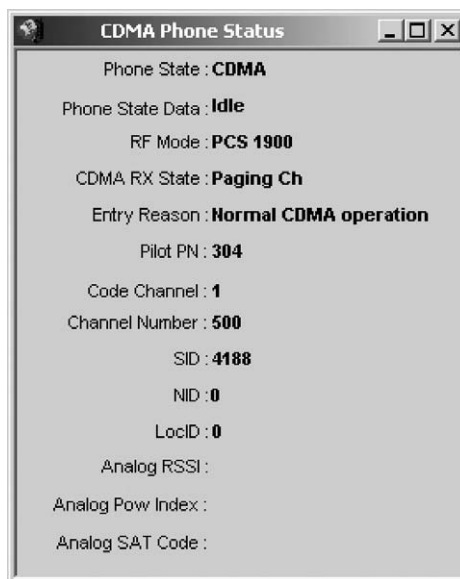
The bottom section is a table that shows the actual rate of the received frame compared with the expected rate of the frame. The rows classify the frames according to the expected rate and the columns classify the frames based on the actual rate at which they were received.

- Bsig column represents the count of frames with signaling information
- Fberr column represents the count of frames received with bit errors
- Eras column represents the count of frames received with erasures

For example, if a Full rate frame was expected and a Quarter rate frame was received, then the count in the third column of the top row would be incremented.

The M-FER graph on the top right hand corner shows the Frame Error Rate.

## CDMA phone status view

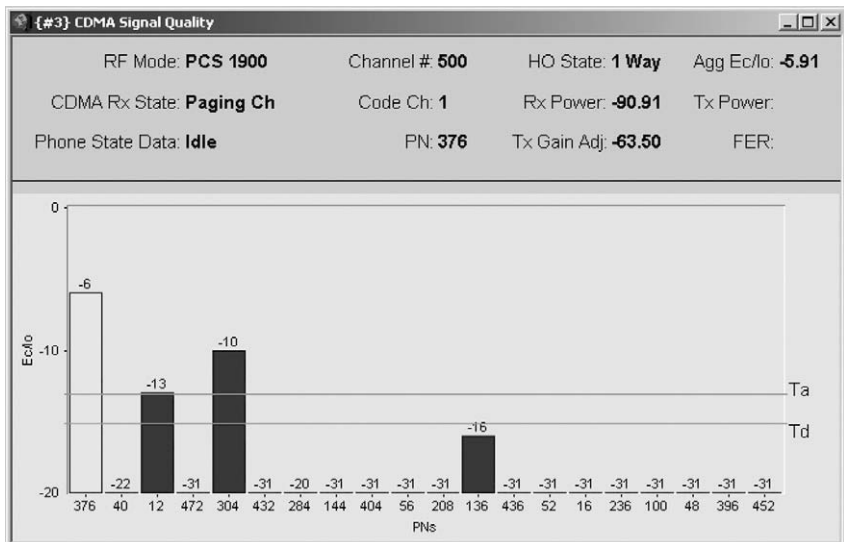


This view displays the current status of the phone and is updated in real time.

- Phone State
- Phone State Data
- RF Mode
- CDMA Rx State
- Entry Reason
- Pilot PN
- Code Channel
- Channel Number
- SID

- NID
- Location ID
- Analog RSSI
- Analog Power Index
- Analog SAT Code

## CDMA Signal Quality view



This view displays the phone state, channel information, power levels, FER and an Ec/Io graph of the PNs that are detected by the searcher. The Ec/Io value is displayed at the top of each column. Six-way PNs are displayed if the system supports them. The following is the color scheme.

Color	Pilot PN
Yellow	Active PN on a call
Cyan	Active PN not in use (for systems that support six-way PNs only)
Green	Candidate PN
Blue	Neighbor PN
Red	PN values over the threshold

Right clicking on the graph lets you set an Ec/Io threshold value for closer examination of Neighbor Set PNs. The Signal Quality view will then display all neighbor set PNs that exceed this threshold in red.

## CDMA Quick Paging Channel

QPCH General Channel					
Channel	Rate	PN	Power Level	THI	THB

QPCH Bit Information						
Status	Type	Position	SD IEngy	SD Q Engy	PI IEngy	PI Q Engy

The General TA w/Supplemental Channel check box must be enabled on the Log Mask tab of the CDMA Properties dialog box. This feature only works with phones that support supplemental channel messages.

### QPCH General Channel

- Channel – the channel number
- Rate – the Quick Paging Channel Rate (4800 or 9600)
- PN – the Pilot number
- Power Level – the Quick Paging channel power level, expressed in dB
- THI – the erasure threshold for Paging Indicator decision.
- THB – the bit threshold for Paging Indicator decision.

### QPCH Bit Information Status

- Status – status values associated with each indicator bit entry. Values are:
  - Indicator Entry Not Applicable
  - Indicator Bit Not Detected
  - Indicator Bit Detected
  - Indicator Bit Erasure
  - Indicator Bit Invalid
- Type – type values associated with each indicator bit entry. Values are:
  - PI (Paging Indicator) Bit #1
  - PI (Paging Indicator) Bit #2
  - CCI (Configuration Change Indicator) Bit #1
  - CCI (Configuration Change Indicator) Bit #2
  - Indicator Bit Invalid
- Position – indicator bit position. This information is not valid for types of CCI. Values are:
  - SD IEngy – soft decision I channel bit energy
  - SD QEngy – soft decision Q channel bit energy
  - PI IEngy – I channel pilot energy
  - PI QEngy – Q Channel pilot energy



## CDMA Signal Strength

The CDMA Signal Strength window displays the following information:

- Rx Power:** -86.25
- Tx Power:** [Empty]
- Tx Gain Adj:** -63.50
- FER:** [Empty]
- Rx Voc Rate:** Blank
- Tx Voc Rate:** Blank
- Agg Ec/Io:** -7.52
- Handoff State:** 1 Way

	Finger 1	Finger 2	Finger 3	Finger 4
PN	304	304	304	[Empty]
Ec/Io	-21.59	-9.55	-12.30	[Empty]
Sector	0x0	0x0	0x0	[Empty]
Position	0xFFEC55D	0xFFEC551	0xFFEC54A	[Empty]

This view displays the following signal information when a Qualcomm phone is in CDMA mode.

- Rx Power
- Tx Power
- Tx Gain Adjust
- FER – frame erasure rate
- Rx Vocoder Rate
- Tx Vocoder Rate
- Aggregate Ec/Io – the sum of the Ec/Io of the fingers, calculated only when at least one finger is locked
- Handoff State
- Finger info – displays the following data for up to three fingers, or for up to four fingers for newer Qualcomm phones
  - PN – the PN number
  - Ec/Io – the signal strength of the PN
  - Sector – the finger's sector in Active Set assignment, displayed in hex
  - Position – the absolute finger position, displayed in hex

## Call Statistics

{#1} Call Stats		
Technology	EVDO Device	Generic CDMA2000 Phone
Label	{#3}	{#4}
Total	9	2
Good	0	2
Blocked	3	0
Dropped	0	0
No Service	6	0
No Comm	0	0
Progress	Idle 5	On Call 21

The Call Stats view shows the call connection, termination classifications and counts, as well as call progress messages for a system with multiple phones. Each device is represented by its own column in a spreadsheet view.

- Technology – technology of the device
- Label – shows device label
- Total – total calls attempted
- Good – number of good calls
- Blocked – number of blocked calls
- Dropped – number of dropped calls
- No Service – number of no service calls (shows the total number of calls that could not be placed or completed due to the loss of network service)
- No Comm – number of no communication calls
- Progress – indicates call progress in seconds

### cdma2000 Service Configurations

	FCH	DCCH
Service Option:		
Frame Size:		
	Fwd	Rev
FCH_RC:		
SCH0_RC:		
SCH1_RC:		
DCCH_RC:		
Trfc Chnl Type:		
Mux Option:		
Chnl Rate:		
Num SCH:		
SCH0 ID:		
SCH0 Mux:		
SCH0 Coding:		
SCH1 ID:		
SCH1 Mux:		
SCH1 Coding:		

The following information is displayed in this view for a cdma2000 phone:

#### Service Option – service option for the current call

- Fwd Chnl Radio Cnfg – radio configuration for the forward channel, values 1-9
- Rev Chnl Radio Cnfg – radio configuration for the reverse channel, values 1-9
- FWD\_SCH0\_RC – radio configuration for the forward supplemental channel 0, values 1-9
- REV\_SCH0\_RC – radio configuration for the reverse supplemental channel 0, values 1-9
- FWD\_SCH1\_RC – radio configuration for the forward supplemental channel 1, values 1-9
- REV\_SCH1\_RC radio configuration for the reverse supplemental channel 1, values 1-9
- F\_DCCH\_RC – radio configuration for the forward dedicated control channel, values

1-9

- R\_DCCH\_RC – radio configuration for the reverse dedicated control channel, values 1-9
- FCH Frame Size – frame size on FCH: 20, 40 or 80 ms
- DCCH Frame Size – frame size on DCCH: 20, 40 or 80 ms
- Fwd Traffic Chnl Type – forward channel traffic type
- Rev Traffic Chnl Type – reverse channel traffic type
- Fwd Mux Option – forward multiplex option
- Rev Mux Option – reverse multiplex option
- Fwd Chnl Rate – forward fundamental channel transmission rates: Full, 1/2, 1/4, 1/8
- Rev Chnl Rate – reverse fundamental channel transmission rates: Full, 1/2, 1/4, 1/8
- Num Fwd SCH – number of active forward supplementary channels
- Num Rev SCH – number of active reverse supplementary channels
- Fwd SCH0 ID – forward supplemental channel 0 identifier
- Rev SCH0 ID – reverse supplemental channel 0 identifier
- Fwd SCH0 Mux – forward supplemental channel 0 multiplex option
- Rev SCH0 – reverse supplemental channel 0
- Fwd SCH0 – forward supplemental channel 0
- Rev SCH0 Mux – reverse supplemental channel 0 multiplex option
- Fwd SCH1 ID – forward supplemental channel 1 identifier
- Rev SCH1 ID – reverse supplemental channel 1 identifier
- Fwd SCH1 Mux – forward supplemental channel 0 multiplex option
- Rev SCH1 Mux – reverse supplemental channel 0 multiplex option
- Rev SCH1 – reverse supplemental channel 1
- Fwd SCH1 – forward supplemental channel 1

## cdma2000 RLP statistics

General	
Service ID:	<input type="text"/>
Aborts:	<input type="text"/>
Resets:	<input type="text"/>
Nacks Rcvd:	<input type="text"/>
Last Round Trip Delay:	<input type="text"/>
RLP Block Used:	<input type="text"/>
Re Xmits Not Found:	<input type="text"/>
Largest Consecutive Erasure:	<input type="text"/>

RX Data	
Burst Size:	<input type="text"/>
Throughput:	<input type="text"/>
ReXmits Frame:	<input type="text"/>
Idle Frame:	<input type="text"/>
Fill Frame:	<input type="text"/>
Blank Frame:	<input type="text"/>
Null Frame:	<input type="text"/>
New Data Frame:	<input type="text"/>
20ms Frame:	<input type="text"/>
Total Bytes:	<input type="text"/>
RLP Erasures:	<input type="text"/>
Mux Erasures:	<input type="text"/>

Tx Data	
<input type="text"/>	Bytes
<input type="text"/>	Kbps

The radio link protocol, RLP, is a negative acknowledgement-based (Nack) protocol. This greatly reduces transmission errors over error-prone wireless links and therefore allows TCP protocol to function of wireless links. RLP statistics are key parameters that highlight the signal quality of the wireless link. These statistics are essential to identify and resolve data integrity issues within the air interface. The cdma2000 RLP Statistics view gives the following RLP information:

### General info

- Service ID – service identification number
- Last Round Trip Delay – last round-trip time measurement
- Aborts – number of Nack aborts
- RLP Block Used:
  - 0 – not received;
  - 1 – specified Nack scheme;
  - 2 – specified RTT (roundtrip time);
  - 3 – specified RTT and Nack scheme
- Resets – number of resets
- Re Xmits Not Found – number of retransmitted frames not found
- Nacks Rcvd – number of negative acknowledgement frames received
- Largest Consecutive Erasure – largest block of consecutive erasures

### Received Counts

- ReXmits Frame – number of received retransmitted frames
- Idle Frame – number of received idle frames

- Fill Frame – number of received fill frames
- Blank Frame – number of received blank frames
- Null Frame – number of received null frames
- New Data Frame – total number of received new data frames
- 20ms Frame – number of received Fundamental data frames
- Total Bytes – total number of received bytes
- RLP Erasures – number of radio link protocol erasures received
- Mux Erasures – number of multiplexer erasures received
- Avg Fwd Throughput – average forward through put in Kbps
- Inst Fwd Throughput – instantaneous forward throughput in Kbps

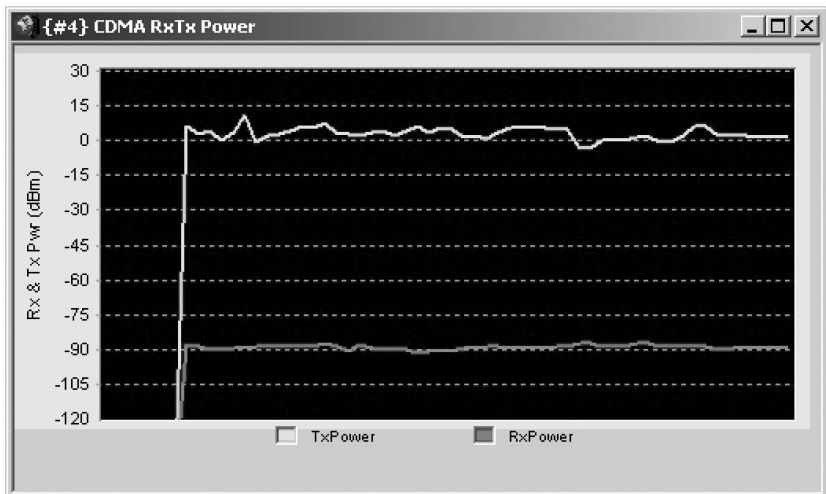
### Transmitted Counts

- ReXmits Frame – number of transmitted retransmitted frames
- Idle Frame – number of transmitted idle frames
- New Data Frame – total number of transmitted new data frames
- 20ms Frame – number of transmitted fundamental data frames
- Total Bytes – total number of transmitted bytes
- Avg Rev Throughput – average reverse through put in Kbps
- Inst Rev Throughput – instantaneous reverse throughput in Kbps

### CDMA TA Graph

This view provides a graphic representation of the signals being tracked by the CDMA or cdma2000 phones and is updated in real time.

### CDMA RxTx Power View - Line graph displays



- Rx and Tx Power – this view displays the received power and transmitted power over time. The Rx power trace is displayed in red and the Tx power trace is displayed in cyan.

Both traces appear on the same graph.

- Rx and Tx Vocoder – this view displays the transmit and receive rate of the voice encoder signal over time. Both traces appear on the same graph. The receive vocoder rate is displayed in red and the transmit vocoder rate is displayed in cyan.
- Tx Gain Adjust – this view displays the Tx gain adjustment power levels during data collection.
- CDMA Frame Erasure Rate – the FER view displays the calculated frame error rate

(FER) as a percentage of steady state errors over time. The range is 0 to 5%.

## CAI messaging

The E6474A system extracts and decodes over-head messaging from the handset. The cdma2000 messages are contained in the message groups listed below.

### Message groups

- Access
- Paging
- Sync
  - Forward traffic
  - Reverse traffic

When the message display is paused, the user can double-click on any message group to show the next level of detail. Individual protocol messages can be selected to be decoded in a separate message window.

The Properties dialog box allows you to control which common air interface (CAI) messages are displayed in the CDMA CAI Messages view. This capability enables the filtering of message groups for specific messages you want displayed. You can also change the font, size and color of the message text.

To open it, click the Properties... button in the CDMA CAI Messages view. This dialog box also enables pop-up views or "message boxes" that display all of the messages of one type.

**Note:** Messages must be enabled on the Log Mask tab and in the CAI Message Filter Properties dialog box in order to display them in the CAI Messages view.

## 1xEV-DO High Data Rate Phone Measurements

Software Option 135, an upgrade of existing cdma2000 phone measurements supports the latest high data rate technology 1xEV-DO. This option requires both cdma2000 and 1xEV-DO software license since the technology supports hybrid mode. Hybrid mode supports wireless devices that can handoff the data session between the 1xEV-DO and cdma2000 network elements. Option 135 provides multiple views to monitor the session, connection, RF and data parameters of the user on both the forward and reverse link.

### CDMA Properties for 1xEV-DO Devices

For 1xEV-DO devices, the CDMA Properties view has an addition tab for setting the 1xEVDO Log Mask in addition to the cdma2000 properties.

### 1xEVDO Access Terminal Info

The screenshot shows a window titled "{EVDO\_GD} 1xEVDO Access Terminal Info". It is divided into three main sections: "Version Number", "Status", and "State Information".

Version Number	
Release Date:	Jan 22 2004
Station Class Mark:	42
AT CAI Revision:	6
AT Model:	95
AT Firmware Rev:	203
Slot Cycle Index:	2
AT Modem Rev:	9712

Status	State Information
CDMA State: Paging Ch	AT State: Connected
AT ESN: 600f469e	Session State: Open
IMSI: 14436026	ALMP State: Connected
RF Mode: HDR	Init Proc State: Inactive
CDMA Channel: 675	Idle State: Inactive
CDMA Code Chn: 31	Connected State: Open
Current PN: 72	Route Upd Proc State: Connected
System ID: 20	OH Msg Prot State: Process All Ms
Network ID: 0	HDR Hybrid Mode: On
	TX Power Limited: 0
	AT PA State: 1

The Access Terminal Info view provides information on the hardware and firmware in the Access Terminal (AT).

#### Version Number

- Release Data – date of the formal release of the chipset firmware
- AT Station Class Mark – provides a slotted/nonslotted indicator
- AT common air interface (CAI) revision
- AT Model – manufacturers mobile model number
- AT Firmware revision – revision number of the AT's firmware
- Slot Cycle Index – reports the slot cycle index used for paging the AT

- AT Modem Rev – reports the revision of the mobile station modem of the AT.

### Status

- CDMA State – current cdma RX process state
- ESN – serial number of AT
- IMSE – CDMA MIN1 of current NAM
- RF Mode – current RF mode
- CDMA Channel – current channel number
- CDMA Code – code channel prior to handoff direction message
- Current PN – PN of current cell
- System ID – current system ID
- Network ID – current network ID

### State Information

- AT State – state of access terminal; inactive, acquisition, sync, idle, access or connected
- Session State – current session state; closed, AMP setup, access terminal initiated negotiation, access node initiated negotiation, open
- ALMP State – session layer protocol state
- Init Proc State – initialization protocol state
- Idle State -
- Connected State
- Route Upd Proc State
- OH Msg Prot State
- HDR Hybrid Mode
- TX Power Limited
- AT PA State

### 1xEVDO Active Set SINR Info

PN	SINR
Active Set 1: 72	5 dB
Active Set 2: 368	1 dB
Active Set 3:	
Active Set 4:	
Active Set 5:	
Active Set 6:	

Active Set 1 to 6 – PN and filtered SINR for up to 6 Active Set Pilots



## 1xEVDO Fwd Channel CRC Counts

Channel	Rate	Good CRC	Bad CRC
Control Channel	38,400	0	0
	76,800	200	0
Traffic Channel	38,400	17	0
	76,800	17	0
	153,600	175	1
	307,200 Short	39	0
	307,200 Long	272	6
	614,400 Short	21	0
	614,400 Long	447	4
	921,699	709	5
	1,228,800 Short	382	3
	1,228,800 Long	1271	5
	1,843,200	325	0
	2,457,600	27	0

This view displays the good and bad CRC counters for Control and Traffic Channel packets. It also contains the number of forward link traffic channel and control channel packets received at various rates.

## 1xEVDO Fwd Rev Link Performance

Forward Link		Reverse Link	
Avg Fwd Link Tput:	1328.0 kbps	Avg Rev Traffic Tput:	36.0 kbps
ARQ Eff Rec Rate:	76.8 kbps	Act Rev Link Rate:	9.6 kbps
RAB Offset:	0	Curr Rev Link Rate:	0.0 kbps
PER(Short):	5 %	Rev Rate Limit:	153.6 kbps
PER(Long):	0 %	DRC Channel Gain:	-3 dB
Req Data Rate(Short):	247.0 kbps	ACK Channel Gain:	4 dB
Req Data Rate(Long):	342.0 kbps	AT Req DRC Rate:	614.4 kbps
Pkt Received Flag:	0	ACK/NACK Status:	Enabled
		ACK/NACK Value:	0

### Forward Link

- Avg Fwd Link Tput – Average throughput on forward link

- ARQ Eff Rec Rate – Forward link data rate based on ACK and early termination.
- RAB Offset - Frame offset for the RAB sent over the forward link
- PER(Short) – Packet Error Rate calculated over 1000 slots
- PER(Long) – Packet Error Rate calculated over 10000 slots
- Req Data Rate(Short) – Averaged over 1000 slots
- Req Data Rate(Long) – Average rate over 10000 slots
- Pkt Received Flag – Indication if packet received in last 16 slots

### Reverse Link

- Avg Rev Traffic Tput – Average rate data is sent on reverse link
- Act Rev Link Rate –
- Curr Rev Link Rate – rate which AT sent last packet
- Rev Rate Limit – Rate limit value sent in the overhead message
- DRC Channel Gain – Ratio of the power level of the DRC channel to the power level of the reverse traffic pilot channel
- ACK Channel Gain – Ratio of the power level of the ACK channel to the power level of the reverse traffic pilot channel
- AT Req DRC Rate – Represents the DRC Rate requested by the AT
- ACK/NACK Status – Denotes if the ACK channel is enabled or disabled
- ACK/NACK Value – Identifies if ACK or NACK was transmitted on the reverse link

### 1xEVDO Reverse Power Control

{EVDO_GD} 1xEVDO Rev Power Control	
Rx AGC: -66 dB	DRC Channel Gain: 8.91 dB
Tx Total Limited: -20 dB	ACK Channel Gain: 0.00 dB
Tx Adjust: -10 dB	Data Channel Gain: 1.25 dB
Tx Pilot: -22 dB	Pilot Channel Gain: 12.56 dB
Max Tx Power RRI: 5	DRC / Pilot: -2.98 dB
DRC Lock Period: 1	ACK / Pilot: dB
RPC History Summary: 2	Data / Pilot: -20.03 dB

- Rx AGC – received signal strength
- Tx Total Limited – total Tx limited power
- Tx Adjust – Tx Closed loop adjustment value
- Tx Pilot – Tx Pilot power
- Max Tx Power RRI – Max RRI recommended value
- DRC Lock Period – Indicates number of slots DRC is locked
- RPC History Summary – Summary of Reverse power control bits for last 10 frames
- DRC Channel Gain – Value reported
- ACK Channel Gain – value reported
- Data Channel Gain – value reported
- Pilot Channel Gain – value reported
- DRC / Pilot – Channel to pilot ratio
- ACK /Pilot – Channel to pilot ratio
- Data /Pilot – Channel to pilot ratio

## 1xEVDO RLP Statistics

General	
Service ID:	1
Resets:	0
Naks Sent:	19
Naks Rcvd:	17
Reset Time:	22:29:09.697
RX ACKs from AN:	0
Re Xmits Not Found:	0
Nak Timeout or Aborts:	0

RX Data		Tx Data	
Phy. Chnl Rate:	1228.8	76.8	Kbps
Channel:	Traffic	Traffic	
No. of Packets:	1	6	
Packet Length:	4	28	
ReXmits:	1824	5879	Frames
ReXmit Bytes:	5879	1824	Bytes
Total Bytes:	1194911	217143	Bytes
Resets:	0	0	
New Data Frames:	1188951	215319	
Duplicate Frames:	81		

### General

- Service ID - Identifies RLP service
- Resets – Total resets that have occurred
- Naks Sent – Number of NAK messages sent
- Naks Rcvd - Number of NAK's received in a single message
- Reset Time - Timestamp for last statistics reset
- RX ACKs from AN – Number of ACK's received from AN
- Re Xmits Not Found – Number of retransmissions not found
- Nak Timeout or Aborts – Number of NAK timeouts or aborts

### Rx and Tx Data

- Phy Chnl Rate (Kbps)
- Channel – channel type, traffic or control
- No of Packets – Number of partial RLP packets logged
- Packet Length – Length of the logged packets
- ReXmits (Frames) – Number of retransmitted frames
- ReXmit Bytes (Bytes) – Number of bytes retransmitted
- Total Bytes (Bytes) – Total number of bytes received
- Resets – Number of resets requested by the AT
- New Data Frames – Number of new data frames received
- Duplicate Frames – Number of received duplicate frames

## 1xEVDO Session Management

{EVDO_GD} 1xEVDO Session Management	
<b>Access Attempt (AA) Info</b>	<b>Connection Attempt (CA) Info</b>
No of Probes: 1	Conn Result: Success
Access Result: ACK received	Conn Duration: 288
Access Duration: 142	Successful Conns: 4
Successful AAs: 8	Failed Conns: 1
Failed AAs: 0	Total Conn Attempts: 5
Total AAs: 8	Allocating PN: 72
Responding PN: 72	Allocating Sector ID: 84737
Accessed Sector ID: 84737	Allocating Color Code: 188
Color Code: 188	Pilot Shuffling: 0
<b>Session Attempt (SA) Info</b>	<b>Connection Release (CR) Info</b>
Assignment Status:	CR Reason:
RATI:	AT Connection Close
Attempt Duration:	
Successful Attempts:	
Failed Attempts:	
Total Attempts:	
Assigning PN:	

### Access Attempt (AA) Info

- No of Probes – Number of probe sequences sent for this access attempt
- Access Results – Results of probe sequence
- Access Duration – Time in slots to complete the attempt
- Successful AAs – Counter for total number of successful attempts
- Failed AAs – Counter for total number of failed attempts per session
- Total AAs – Counter for total number of attempts per session
- Responding PN – PN of the sector that sends the ACK or the TCA message
- Accessed Sector ID – Sector ID on which the Access Probe was sent
- Color Code – Color code of the sector on which the Access Probe was sent

### Connection Attempt (CA) Info

- Conn Result – Details of denied request or success message
- Conn Duration – Time (in slots) taken to complete the attempt
- Successful Conns – Counter for total number of successful connections
- Failed Conns – Counter for total number of connection failures
- Total Conn Attempts – Counter for total number of connection attempts since power-up
- Allocating PN – The PN of the sector allowing or denying connection
- Allocating Sector ID – ID of the sector allowing or denying connection
- Allocating Color Code – Color code of the sector allowing or denying connection
- Pilot Shuffling – Number of times the active set pilot changed during the connection attempt

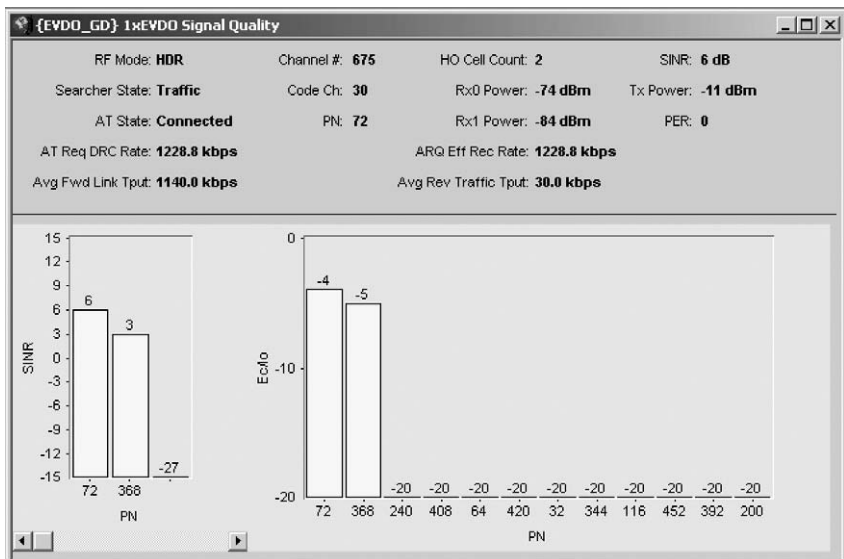
### Session Attempt (SA) Info

- Assignment Status – Indication if UATIAssignment message was received
- RATI – Random Access Terminal ID (RATI) used for opening a session
- Attempt Duration – Time (in slots) taken to complete the attempt
- Successful Attempts – Counter for total number of successful attempts to open a session
- Failed Attempts – Counter for total number of failed attempts to open a session
- Total Attempts – Counter for total number of attempts to open a session since power-up
- Assigning PN – PN of the sector that sent the UATIAssignment message

### Connection Release (CR) Info

- CR Reason – This represents the reason for a call termination

## 1xEVDO Signal Quality



This view provides a composite view of both the Fwd and Rev link RF quality and the resulting data throughput. You can compare the requested data rate against the average Fwd link throughput and the effective Fwd link received rate along with the Rev link throughput. The view also displays the AT's current RF mode and connection status.

Graphical bar charts on the lower half of the view provided Ec/Io and SINR values as measured in the AT. The top six active set PN's are displayed along with the candidate and neighbor set information.

- RF Mode – Current mode of the RF hardware
- Searcher State – Displays the current state of the searcher
- AT State – Summary of access terminal states
- AT Req DRC Rate – The DRC rate requested by the AT
- Avg Fwd Link T'put – This is a calculated value based on counters of the good and bad DRC frames received for each rate
- Channel # – Center frequency channel
- Channel Code – Walsh ID used
- PN – DRC cover of the serving pilot
- HO Cell Count – Number of cells involved in the soft handoff
- Rx0 Power – Total receive power as seen by antenna 0
- Rx1 Power – Total receive power as seen by antenna 1
- ARQ Eff Rec Rate – Data rate at which the traffic channel packet was decoded

- Avg Rev Traffic T'put – Average throughput for the reverse traffic channel as a function of the number of reverse link traffic packets transmitted at various rates
- Tx Power – Total TX power as determined by the entire TX AGC mechanism
- PER – Instantaneous Packet Error Rate

## Receiver-based software

The Agilent E6474A software option 111 (receiver only license) or 121 (phone and receiver license) provide the functions described below. The receiver measurement functions of the Agilent E6474A system is provided by either option 111 and 121. Either software option, combined with the appropriate receiver hardware option, allows four primary elements:

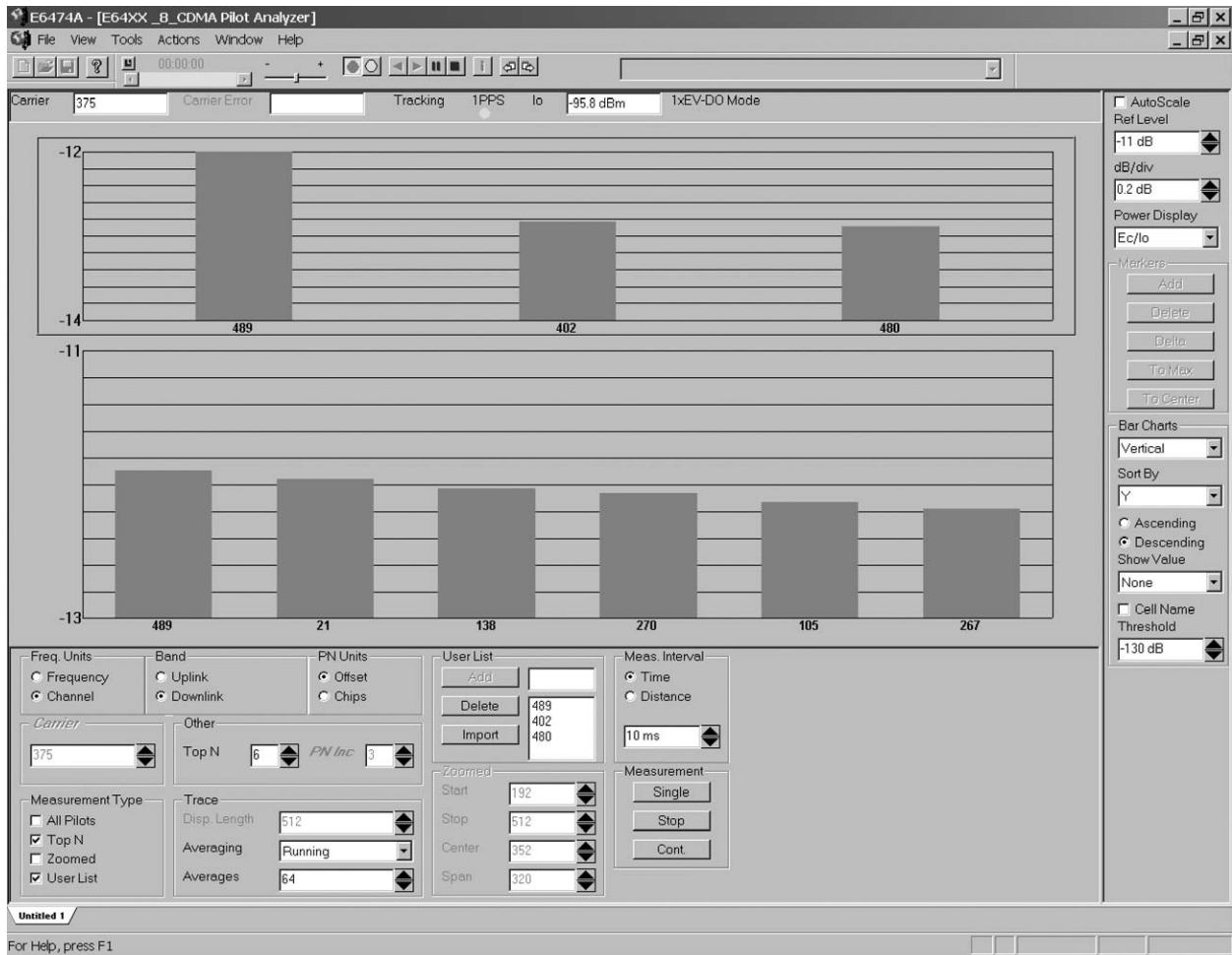
- CDMA Pilot Channel Analysis
- Spectrum Analysis
- CW Power
- Channel Power

Each element has an associated control view and display view. The software can control up to four Agilent digital RF receivers. The controls listed below are available for the receiver measurements:

- Measurement interval
  - Time
  - Distance
- Averaging
  - Running
  - Group
  - Max Hold
  - At Least (CW and channel power only)

The measurement interval defines the duration between measurements. This can be specified in terms of time (e.g., execute a measurement every 200 milliseconds) or distance (e.g., execute a measurement every 10 meters). If the user defines an interval that the system can not achieve, a busy light indicates this condition.

## 1xEV-DO Pilot Channel Analysis



The Agilent E6474A system measures 1xEV-DO, cdma2000, IS-95 and J-STD-008 CDMA pilot channels. These measurements are independent of network parameter settings. The system executes four different types of CDMA pilot channel measurements (listed below). Any or all of them can be executed simultaneously.

The Agilent “C” revision receiver can measure both 1xEV-DO and cdma2000 carriers with one receiver by opening two Pilot Analyzer views and properly configuring the measurement Mode.

### Measurement types

- All pilots: The system measures the power, both  $E_c$  and  $E_c/I_o$ , of all 512 pilot channels. The results are displayed as a trace with one point for each of the 512 PN offsets.
- Top N: The system measures all of the pilots in the network and returns the ‘N’ strongest pilot channels received, where ‘N’ is a user definable integer from 1 to 20. The results are displayed in bar graph format.
- Zoomed pilots: The user sets the center and span in terms of chips (or PN offsets). The results are displayed as a trace.
- User list: The user manually inputs a list of up to 40 PN offsets to be measured. The measurements are displayed in bar graph format – up to 20 bars. If more than 20 channels are in the list, all channels will be measured and recorded, but only 20 will be displayed.

### Measurement controls

- Carrier frequency
- Frequency
- Channel
- All Pilots
- Top N Pilots
- Zoomed Pilots
- User list of Pilots
- PN Increment

### Display controls

- Power display (Y-axis parameter)
  - $E_c/I_o$
  - $E_c$
- Show value (bar graphs only)
  - $E_c/I_o$  (dB)
  - $E_c$  (dBm)
  - Aggregate  $E_c/I_o$  (dB)
  - Aggregate  $E_c$  (dBm)
  - Aggregate - Peak (dB)
  - Delay Spread (chips)
  - Pilot Delay (chips)

### Markers (trace displays only)

- Multiple markers
- Delta markers
- To Max function
- Drag and drop

### Measurement results

- Peak  $E_c/I_o$
- Peak  $E_c$
- $I_o$
- Aggregate  $E_c/I_o$  (TopN and user list only)
- Aggregate  $E_c$  (TopN and user list only)
- Aggregate - peak (TopN and user list only)
- Delay spread (TopN and user list only)
- Pilot delay
- Carrier frequency error

**Peak pilot power (both  $E_c$  and  $E_c/I_o$ )** is computed by selecting the strongest peak of the correlation for each pilot.  $I_o$  is the total received power integrated across the entire 1.2288 MHz signal bandwidth.

**Aggregate pilot power (both  $E_c$  and  $E_c/I_o$ )** is computed for a given pilot by integrating the power received over the time dispersion of that pilot. Delay spread is the duration of time over which this power is dispersed. Both aggregate pilot power and delay spread are determined with respect to an  $E_c/I_o$  threshold of -17 dB. The system also reports the difference between the aggregate and peak pilot power (aggregate-peak). This difference along with the delay spread provides a characterization of the multipath effect on that pilot. Aggregate pilot power and delay spread are only measured for the TopN and user list measurement types.

**Pilot delay** is defined as the difference in time between when a pilot signal is received and when it should have been transmitted, as defined by GPS timing. For example, a

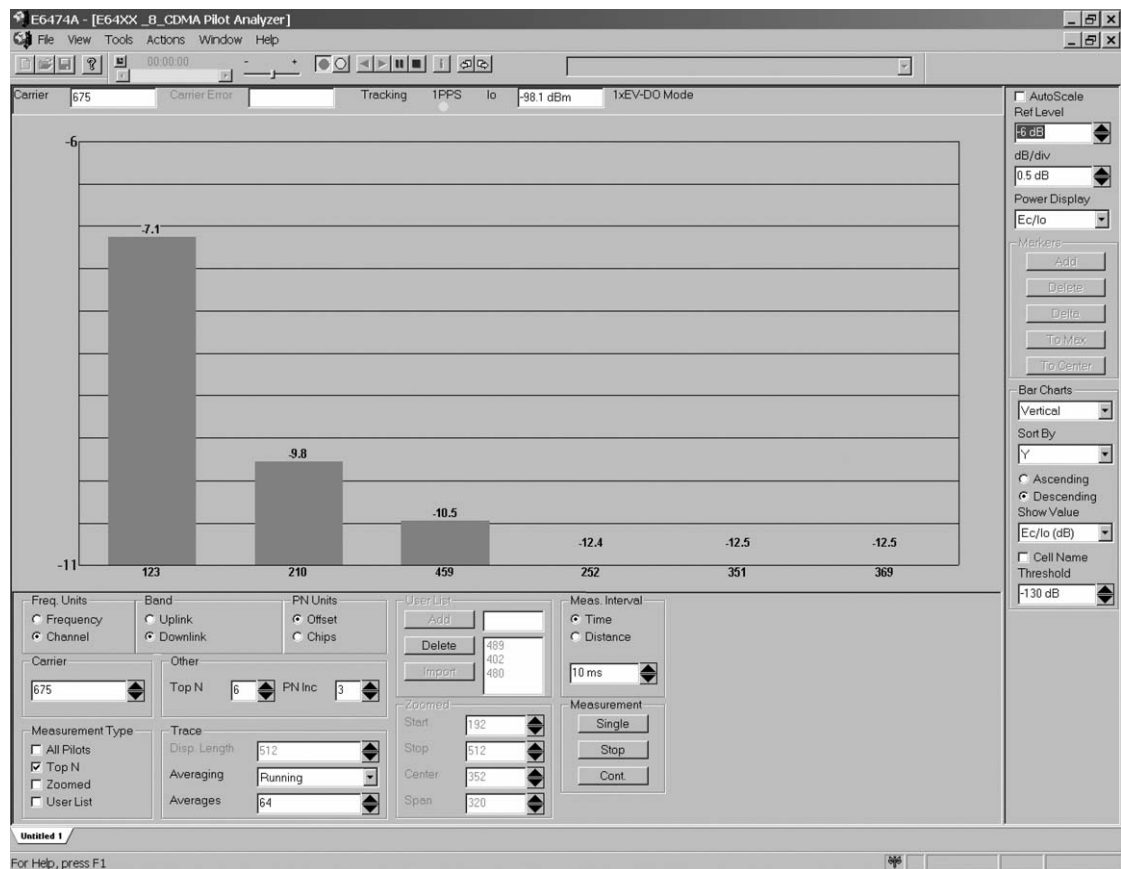


base station transmitting PN offset 0 is expected to start a new short-code pattern synchronous with the GPS even second clock. If the signal is received 3 chips after the GPS even second clock, then the pilot delay is said to be 3 chips (1 chip = 0.8 microseconds). Timing offsets can be due to both propagation delay and base station timing problems.

Carrier frequency error is defined as the difference between the measured carrier frequency and the user-specified carrier frequency. The measured carrier frequency is of the dominant pilot signal. Carrier frequency error can be due to both base station carrier error and Doppler shift (if moving).

## 1xEV-DO High Data Rate Receiver Measurements

Access to the 1xEVDO receiver measurements is via the cdma2000 to 1xEVDO Receiver measurement upgrade software license, E6474A-136. The cdma2000 Receiver measurement license must already be available on the E6474A platform to enable the E6474A-136 1xEVDO receiver measurement set.



Existing Agilent CDMA "C" version receiver hardware is used for the 1xEVDO measurements, however a firmware update may be required. This firmware upgrade is free of charge and will be prompted for installation by the E6474A platform software on the initial set-up attempt. Older "B" version receivers can be upgraded through the Agilent Service Center to support this option. Contact your field engineer for pricing.

Measurements and display capability are the same as those described in cdma 2000 Pilot Channel Analysis.

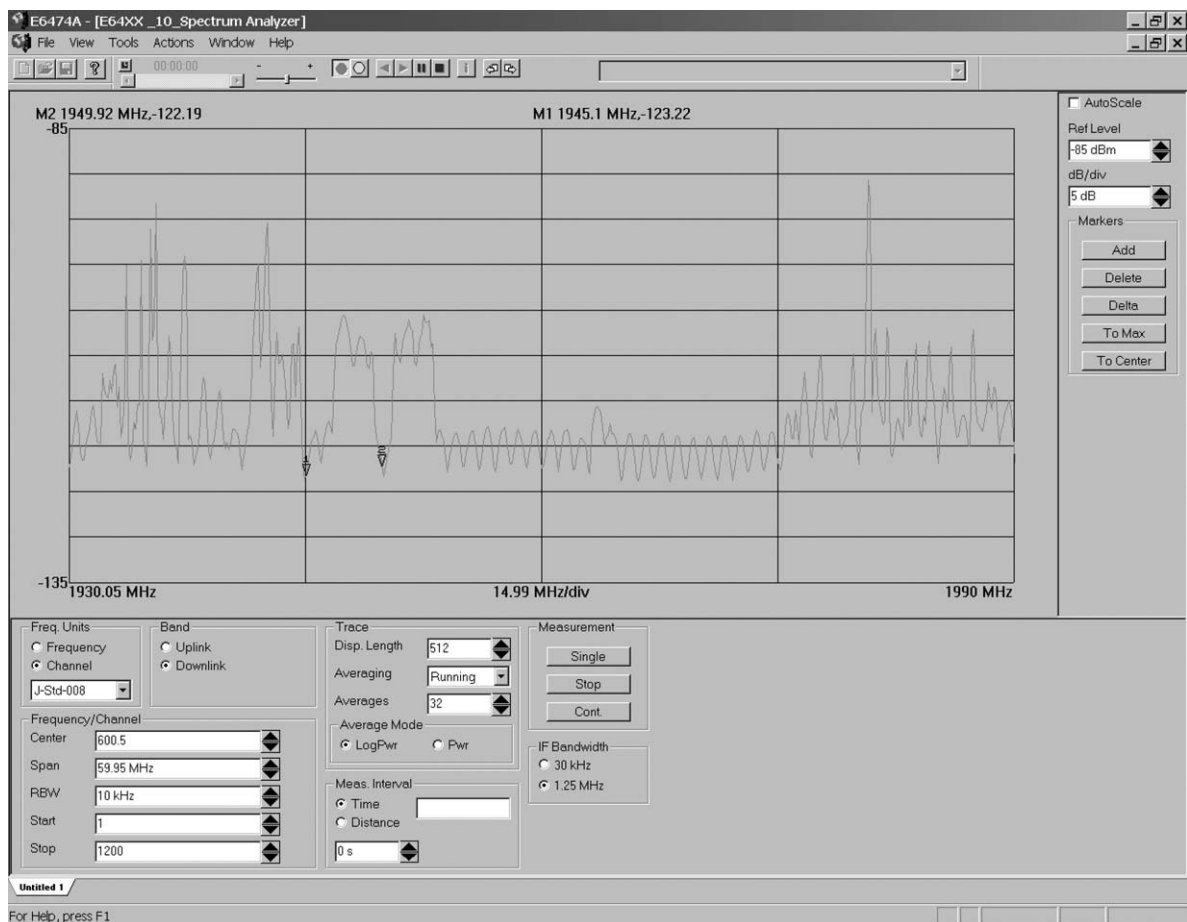
The 1xEVDO Receiver will accurately detect and identify PN peaks that have a delay from -31 to + 74 Chips (105 chip window) or a distance of approximately 11 miles, however Ec/Io accuracy will degrade with distance:

PN Delay	Ec and Ec/Io Accuracy
-12 to +26 (Approx. 3.5 Miles)	+/- 1dB
-18 to +32 (Approx. 5 Miles)	+/- 2dB
-26 to +40 (Approx. 6 Miles)	+/- 3dB
-31 to +48 (Approx. 7.25 Miles)	+/- 4dB

Io and Delay measurements are accurate to  $\pm 1$  db and 1Chip respectively for both High speed/less accurate (0 to -8 db of dynamic range) and Slow/more accurate (0 to -11 db of dynamic range).

This level of performance is better than commercial 1xEVDO Access Terminals, and this performance is designed to ensure identification of problems, prior to them becoming customer affecting.

## Spectrum Analysis



The spectrum display provides the controls listed below. Frequencies can be specified in terms of frequency units or channel number. Note: the spectrum analyzer functionality will only be supported when using an Agilent E645x receiver.

## Measurement controls

Frequency, tunable range

Cellular band receiver (E6452C)

- 824 - 894 MHz [819 – 854]
- 869 - 894 MHz [864 – 899]

PCS band receiver (E6450C)

- 1850 - 1910 MHz [1845 – 1915]
- 1930 - 1990 MHz [1925 – 1995]

IMT 2000 receiver (E6455C)<sup>1</sup>

- 1920 - 1980 MHz [1895 – 1990]
- 2110 - 2170 MHz [2100 – 2180]

Japan cellular band receiver (E6457C)

- 832 - 870 MHz [827 – 875]
- 887 - 925 MHz [882 – 920]

Korea PCS band receiver (E6453C)

- 1710 - 1785 MHz [1705 – 1785]
- 1805 - 1880 MHz [1800 – 1885]

## Frequency, maximum span

Cellular band receiver (E6452C)

- 25 MHz [35]

PCS band receiver (E6450C)

- 60 MHz [70]

IMT 2000 band receiver (E6455C)<sup>1</sup>

- 60 MHz [70]

Japan Cellular band receiver (E6457C)

- 38 MHz [48]

Korea PCS band receiver (E6453C)

- 75 MHz [85]

## IF bandwidth<sup>2</sup>

Cellular Band, PCS Band, and Japan Cellular Band Receivers

- 30 kHz
- 1.25 MHz

IMT 2000 Band Receiver

- 1.25 MHz
- 5.0 MHz

Korea PCS Band Receiver

- 200 kHz
- 1.25 MHz

## Resolution bandwidth<sup>3</sup>

Cellular Band, PCS Band, and Japan Cellular Band Receivers

- 8.36 kHz to 1 MHz (1.25MHz IF Bandwidth)
- 246 Hz to 28 kHz (30 kHz IF Bandwidth)

IMT-2000 Band Receiver

- 8.36 kHz to 1 MHz (1.25 MHz IF Bandwidth)

1. Korea PCS band receiver and IMT-2000 band receiver does not have kHz IF bandwidth. Korea PCS band receiver has a 200 kHz and a 1.25 IF bandwidth. IMT-2000 band receiver has a 1.25 MHz and a 5 MHz IF bandwidth.
2. Does not imply warranted performance, but rather characteristic performance. Tested with minimum resolution bandwidth: 246 Hz with 30 kHz IF bandwidth, 8.46 kHz with 1.25 MHz IF bandwidth, 1.68 kHz with 200 kHz IF bandwidth (Korean receiver), 25.08 kHz with 5.0 MHz IF bandwidth (IMT-2000 band receiver).

- 25.08 kHz to 2.85 MHz (5MHz IF Bandwidth)
- Korea PCS Band Receiver
- 8.36 kHz to 1 MHz (1.25 MHz IF Bandwidth)
  - 1.68 kHz to 190 kHz (200 kHz IF Bandwidth)

#### Average Mode

- Log Power
- Power

#### Markers

- Multiple markers
- Delta markers
- Marker to max
- Marker value to center frequency
- Drag and drop

#### Spectrum noise floor (characteristic) :

#### Cellular Band, PCS Band, Japan Cellular Band Receiver

	Average	Peak
30 kHz IF Bandwidth / 300 kHz span	-139 dBm	-131 dBm
1.25 MHz IF Bandwidth / 300 kHz span	-128 dBm	-119 dBm
30 kHz IF Bandwidth / 25 MHz span	-132 dBm	-129 dBm
1.25 MHz IF Bandwidth / 25 MHz span	-123 dBm	-117 dBm

#### IMT 2000 Band Receiver

	Average	Peak
1.25 MHz IF Bandwidth / 300 kHz span	-128 dBm	-119 dBm
5.0 MHz IF Bandwidth / 300 kHz span	-124 dBm	-111 dBm
1.25 MHz IF Bandwidth / 25 MHz span	-123 dBm	-117 dBm
5.0 MHz IF Bandwidth / 25 MHz span	-117 dBm	-113 dBm

#### Korea PCS Band Receiver

	Average	Peak
200 kHz IF Bandwidth / 300 kHz span	-139 dBm	-130 dBm
1.25 MHz IF Bandwidth / 300 kHz span	-131 dBm	-121 dBm
200 kHz IF Bandwidth / 25 MHz span	-127 dBm	-123 dBm
1.25 MHz IF Bandwidth / 25 MHz span	-123 dBm	-117 dBm

#### Minimum sweep speed (characteristic) :

30 kHz IF Bandwidth    1 MHz / sec

200 kHz IF Bandwidth 10 MHz / sec  
1.25 MHz IF Bandwidth 70 MHz / sec  
5.0 MHz IF Bandwidth 200 MHz / sec

Spectrum measurement allows tuning  $\pm 10$  MHz above and below specified frequency ranges. In addition, the PHS band is also covered (down to 1895MHz). These extended ranges are shown in brackets – [ ]. The performance is not specified in these extended ranges.

Characteristic noise floor increase is 2 dB  $\pm 10$  MHz. At  $-25$  MHz with respect to specified range, the characteristic noise floor increase is 5dB. Characteristic amplitude accuracy is unchanged with respect to specified range.

**Note:** Specifications describe warranted performance over the temperature range of 0 to 55 degrees Celsius and include a 30 minute warm-up from ambient conditions. Typical and characteristic information provides useful but non-warranted performance parameters. Typical refers to test data at the fiftieth percentile for a 25-degree Celsius room temperature. Characteristic information describes product information for parameters that are either not subject to variation, non-measurable, verifiable through functional pass/fail tests, or routinely not measured.

## CW power and channel power

The Agilent E6474A can measure the peak power (CW power) at user-defined frequencies within a user-defined resolution bandwidth. The systems can also measure the total power (channel power) within a user-defined bandwidth at a user-defined set of frequencies. Channel power differs from the CW power measurement in that the total power is integrated across the specified channel width. The user can define the frequencies measured in two different ways, indicated below. Note: CW power and channel power measurements will only be supported when using an Agilent E645x receiver.

Frequency entry methods

- List - Enter an arbitrary list of frequencies.
- Trace - Enter a start frequency, step size, and count. The system measures at the start frequency, at the (start + step) frequency, ... , (start + (count - 1)\*step) frequency. For example, if the start frequency is set to 1900 MHz, the step size is set to 1 MHz, and the count is set to 4; then measurements are made at 1900 MHz, 1901 MHz, 1902 MHz and 1903MHz.

Frequencies can be specified in terms of frequency units or channel number.

## Measurement controls

### Frequency

- Arbitrary list (list)
- Start / step / count (trace)

### IF bandwidth<sup>1</sup>

- 5.0 MHz (IMT-2000 band (wideband) only)
- 1.25 MHz

1. Korea PCS band receiver and IMT-2000 band receiver does not have 30 kHz IF bandwidth. Korea PCS band receiver has a 200 kHz and a 1.25 MHz IF bandwidth. IMT-2000 band receiver has a 1.25 MHz and a 5 MHz IF bandwidth.

- 200 kHz (Korea PCS band (narrowband) only)
- 30 kHz

#### **Resolution bandwidth (CW power only)**

#### **Cellular band, PCS band, and Japan cellular band receivers**

- 8.36 kHz to 1 MHz (with 1.25MHz IF bandwidth)
- 246 Hz to 28 kHz (with 30 kHz IF bandwidth)

#### **IMT-2000 band receiver**

- 8.36 kHz to 1 MHz (with 1.25 MHz IF bandwidth)
- 25.08 kHz to 2.85 MHz (with 5MHz IF bandwidth)

#### **Korea PCS band receiver**

- 8.36 kHz to 1 MHz (with 1.25 MHz IF bandwidth)
- 1.68 kHz to 190 kHz (with 200 kHz IF bandwidth)

#### **Channel width (channel power only)**

#### **Cellular band receiver (E6452C)**

- 8.36 kHz to 25 MHz with 1.25 MHz IF bandwidth
- 246 Hz to 25 MHz with 30 kHz IF bandwidth

#### **PCS band receiver (E6450C)**

- 8.36 kHz to 60 MHz with 1.25 MHz IF bandwidth
- 246 Hz to 60 MHz with 30 kHz IF bandwidth

#### **IMT 2000 receiver (E6455C )**

- 8.36 kHz to 60 MHz (with 1.25 MHz IF bandwidth)
- 100 kHz to 60 MHz (with 5.0 MHz IF bandwidth)

#### **Japan cellular band receiver (E6457C)**

- 8.36 kHz to 38 MHz (with 1.25 MHz IF bandwidth)
- 246 Hz to 38 MHz (with 5.0 MHz IF bandwidth)

#### **Korea PCS band receiver (E6453C )**

- 8.36 kHz to 75 MHz (with 1.25 MHz IF bandwidth)
- 1.68 kHz to 75 MHz (with 200 kHz IF bandwidth)

## **RF Receiver Hardware**

There are five CDMA digital RF receiver options for the Agilent E6474A system:

- E6452C - cellular band receiver with internal GPS receiver
- E6453C - Korea PCS band receiver with internal GPS receiver
- E6455C - 2100 MHz IMT 2000 receiver with internal GPS receiver
- E6457C - Japan cellular band receiver with internal GPS receiver
- E6450C - PCS band receiver with internal GPS receiver

The Agilent E6474A system with CDMA option 111 or option 121 has the software function for controlling the receivers. The system supports any combination of receivers, up to a total of four. Using multiple receiver configurations can greatly improve drive test efficiency for applications such as monitoring competitive networks. In multiple receiver configurations the receivers communicate with each other via a high speed serial ring. Communication with the PC is done via a single RS-232 link to one of the receivers in the

ring. Multiple receiver configurations can also be achieved by use of the E6473A direct connect hub (see E6473A direct connect hub product overview, literature number 5988-3176EN, for further details).

Each receiver option includes:

- RF antenna for the corresponding frequency band
- Cable to connect to other receivers
- Cable to connect to PC
- Kit for mounting receiver in a vehicle
- AC/DC power supply
- Cigarette lighter power cord
- GPS antenna with cable

## Agilent digital RF receiver specifications

### Agilent E6450C, E6452C, E6453C, E6455C and E6457C

#### Frequency

Frequency range<sup>1</sup>

E6452C	824-849 MHz [819 – 854]
	869-894 MHz [864 – 899]
E6450C	1850-1910 MHz [1845 – 1915]
	1930-1990 MHz [1925 – 1995]
E6455C <sup>1</sup>	1920-1980 MHz [1895 – 1990]
	2110-2170 MHz [2100 – 2180]
E6457C	832-870 MHz [827 – 875]
	887-925 MHz [882 – 930]
E6453A <sup>1</sup>	710-1785 MHz [1705 – 1790]
	1805-1880 MHz [1800 – 1885]

Frequency accuracy

- $\pm 1$  ppm with GPS time synchronization
- $\pm 0.05$  ppm characteristic

IF bandwidth<sup>2</sup>

- 30 kHz characteristic
- 200 kHz characteristic (options #390, #391 only)

1. Spectrum measurement allows tuning  $\pm 10$  MHz above and below specified frequency ranges. In addition, for the IMT-2000 band receiver (option #360 and #361), the PHS band is also covered (down to 1895MHz). These extended ranges are shown in brackets – [ ]. The performance is not specified in these extended ranges. Characteristic noise floor increase is 2 dB  $\pm 10$  MHz. For the IMT-2000 band receiver, at  $-25$  MHz with respect to specified range, the characteristic noise floor increase is 5 dB. Characteristic amplitude accuracy is unchanged with respect to specified range.

- 1.25 MHz characteristic
- 5 MHz characteristic (options #360, #361 only)

Aging of TCXO

- $\pm 1$  ppm/year

## Amplitude

Accuracy

- Accuracy for cellular band, PCS band, and Japan cellular band receiver

30 kHz IF bandwidth

- $\pm 0.5$  dB typical from  $-25$  dBm to  $-110$  dBm 1.25 MHz IF bandwidth
- $\pm 0.5$  dB typical from  $-25$  dBm to  $-110$  dBm

Noise figure

- 8 dB typical

Internally generated spurious, input referred

-120 dBm for 30 kHz IF Bandwidth

-120 dBm for 1.25MHz IF Bandwidth

Adjacent channel desensitization<sup>4</sup>

-25 dBm typical

Adjacent channel rejection<sup>5</sup>

45 dB typical

- Accuracy for IMT 2000 band receiver

1.25 MHz IF bandwidth

- $\pm 0.5$  dB typical from  $-25$  dBm to  $-110$  dBm

5.0 MHz IF bandwidth

- $\pm 0.5$  dB typical from  $-25$  dBm to  $-100$  dBm

Noise figure

- 8 dB typical

Internally generated spurious, input referred

- -120 dBm for 1.25MHz IF Bandwidth
- -115 dBm for 5MHz IF Bandwidth

1. Spectrum measurement allows tuning  $\pm 10$  MHz above and below specified frequency ranges. In addition, for the IMT-2000 band receiver (option #360 and #361), the PHS band is also covered (down to 1895MHz). These extended ranges are shown in brackets – [ ]. The performance is not specified in these extended ranges. Characteristic noise floor increase is 2 dB  $\pm 10$  MHz. For the IMT-2000 band receiver, at  $-25$  MHz with respect to specified range, the characteristic noise floor increase is 5dB. Characteristic amplitude accuracy is unchanged with respect to specified range.
2. Korea PCS band receiver and IMT-2000 band receiver does not have 30 kHz IF bandwidth. Korea PCS band receiver has a 200 kHz and a 1.25 MHz IF bandwidth. IMT-2000 band receiver has a 1.25 MHz and a 5 MHz IF bandwidth.
3. It is recommended that the input signal level not exceed  $-40$  dBm.
4. Adjacent channel desensitization applies to the 1.25 MHz IF filter and is defined as the 1 dB compression of tuned signal with interfering signal  $\pm 1.25$  MHz from tuned signal.



Adjacent channel desensitization<sup>6</sup>

- -20 dBm typical

Adjacent channel rejection<sup>7</sup>

- 25 dB typical
- Accuracy for Korea PCS band receiver

200 kHz IF bandwidth

- $\pm 0.5$  dB typical from  $-25$  dBm to  $-100$  dBm

1.25 MHz IF bandwidth

- $\pm 0.5$  dB typical from  $-25$  dBm to  $-100$  dBm

Noise figure

- 8 dB typical

Internally generated spurious, input referred

- -120 for 200 kHz IF Bandwidth
- -120 dBm for 1.25 MHz IF Bandwidth

Adjacent channel desensitization<sup>4</sup>

- -25 dBm typical

Adjacent channel rejection<sup>8</sup>

- 45 dB typical

Maximum safe input level

+10 dBm, 20V DC characteristic

1 dB compression point<sup>3</sup>

-15 dBm characteristic

## Input/Output

RF input      50W type-N

## Connectors

Computer      RS-232 (DB9) Male

GPS            RS-232 (DB9) Male

Power DC power jack 100 mils, positive center

## Misc

Operating temperature range

0 to 55 °C

5. Adjacent channel rejection applies to the 30 kHz IF filter and is defined as the suppression of interfering signal  $\pm 30$  kHz from tuned signal.
6. Adjacent channel desensitization for IMT-2000 band receiver applies to the 5.0 MHz IF filter and is defined as the 1 dB compression of tuned signal with interfering signal  $\pm 1.25$  MHz from tuned signal.
7. Adjacent channel rejection for IMT-2000 Band Receiver applies to the 1.25 MHz IF filter and is defined as the suppression of interfering signal  $\pm 1.25$  MHz from tuned signal.
8. Adjacent channel rejection for Korea band receiver applies to the 200 kHz IF filter and is defined as the suppression of interfering signal  $\pm 200$  kHz from tuned signal.

**Maximum relative humidity**

80% for temperatures up to 31 °C, decreasing linearly to 50% relative humidity at 40 °C

**Storage temperature range**

-40 to 70 °C

**Dimensions**

6 in x 3 5/8 in x 8 \_ in  
15.24 cm x 9.21 cm x 20.32 cm

**Weight**

4.6 lbs. (2.1 kg)

**Power**

9-34 V DC, 9W with Internal GPS (options #301, #311)  
9-34 V DC, 10W Internal GPS

**GPS receiver**

8 Channel internal GPS receiver

**Connector type**

SMA

Differential compatible without dead reckoning

**Note:** Specifications describe warranted performance over the temperature range of 0 to 55 degrees Celsius and include a 30-minute warm-up from ambient conditions. Typical and characteristic information provides useful information by giving nonwarranted performance parameters. Typical refers to test data at the fiftieth percentile for a 25 degree Celsius room temperature. Characteristic information describes product information for parameters that are either not subject to variation, non-measurable, verifiable through functional pass/fail tests, or as a matter of routine not measured.

**E645xC Receivers built-in GPS system**

- 8 channel GPS receiver
- Mounted inside Agilent RF receiver enclosure
- SMA antenna connector
- Bulkhead mount antenna with cable
- Magnetic mount antenna with cable
- Differential compatible
- Not dead reckoning compatible

## Handset compatibility

The E6474A cdma2000 drive-test system supports several cdma2000 phones and is fully compatible with IS-95. Each phone requires a cable to connect to the PC. Phones are not available from Agilent. It is recommended that you contact the phone supplier or manufacturer for phone purchasing information.

For a complete list of the latest supported phones, refer to the supported phones list that is supplied with the E6474A software or contact your local Agilent representative for details.

Currently, all Qualcomm chipset phones are supported.

The E6473A phone cabling options are specially designed to work with the Agilent direct connect USB hub kits (E6474B-015). These cables are available as E6474B-8xx, please refer to the configuration guide (5988-2396EN) for more information. The USB hub kits not only provide phone connectivity to the PC but also power to the phone. For users who do not wish to use the USB hub kits, a special adapter is provided to allow the phone cable to be directly connected to the PC; however, power is not available for the phone. The USB hub kits are ordered using the drive-test accessory product.

## Features common to the E6474A platform

There are a number of features that are common to the E6474A platform software and that are available in all technologies. These features include the ability to record and playback data sets, export the data to post-processing software packages, display parameters on time charts and route maps and define flexible alerts and alarms, based on user requirements. These features are detailed in this section:

- View management
- Cell naming
- Report generator
- Call Statistics view
- GPS
- Data recording and playback
- Data export
- Link editor
- Measurement Parameters view
- Custom view
- Alarms view
- Time charts
- Route map view

### View Management

A view management tool is available to enable a reduced number of views to be presented to the drive-test technician. Specific views can be selected or deselected for display.

### Tabbed Worksheets

The E6474A Network Optimization Platform gives full flexibility of workspace management through the tabbed worksheet feature. Any measurement Views can be displayed on any worksheet, and indeed can be displayed on multiple worksheets if desired. This provides the user the flexibility to represent data and information and group Views to their own preference.

### Cell Naming

The phone-based measurements and receiver-based broadcast channel analyzer provide cell naming features. The cell naming features are dependent on the user providing a text file database with position and cell configuration information. Where the cell ID is known, for example in the phone serving cell measurement, this is used to correlate with the cell name in the database. Where no cell ID is known, for example in neighbor cell measurements or receiver based measurements, a "best guess" algorithm is implemented. This algorithm makes use of the geographic location, ARFCN and BSIC to attempt to determine which cell from the database is the best match. The format of the cell database is a text file with the following fields:

- Cell name
- Longitude
- Serving ARFCN
- TCH ARFCN
- Latitude
- Cell ID
- Azimuth

A number of Cellsite database formats can be imported, including:- TXT, Agilent StationInfo files, ICS, AXF, BXF, CDB, MDB, HP

## **Report generator**

The E6474A system provides fast and easy report generation. The Report generator command is available at any time during logging, Live Update mode, or when replaying a data file. All of the active views are captured, and an HTML document is created that contains a screen capture of each active view. Each report includes a header section and a dialog box prompts the user to enter the header information listed below. Smart defaults and persistent information are used (marked \*), so minimal text entry is required. There is no limit to the number of reports that can be generated.

### **Header elements:**

- Report title\*
- User name
- Company
- Time\*
- Date\*
- Location\* – defaults to current GPS fix
- Comments – user entered notes

## **Call Statistics view**

Call Statistics are displayed in the Call Stats view. The Call Stats view shows the call termination classifications and counts, and call progress messages. For a system with multiple phones, each device is represented by its own column.

- Technology (technology of the device)
- Label (shows device label)
- Total calls
- # of good calls
- # of blocked calls
- # of dropped calls
- # of no service calls (shows the total number of calls that could not be placed or completed due to the loss of network service.)
- # of no communication calls
- Progress (A message indicating the call progress is displayed in this field)

## **GPS**

The Agilent E6474A system has the ability to work with several types of GPS interfaces. The system is compatible with the communications protocols listed below. The physical interface is RS-232 with a DB9 connector. Supported GPS navigators include Agilent Direct Connect GPS/DR Navigation, Garmin GPS II Plus and Trimble Placer GPS 455DR. Details of Agilent-supplied navigator hardware is provided in the "Additional Options" section of this document.

### **Compatible protocols**

- TAIP
- TSIP
- NMEA

The PC clock is synchronised to GPS clock, on selection of Live or Record mode, if a valid GPS device is configured. This synchronization can be disabled.

## Data recording

The following commands appear on the Log pull-down menu. The commands are also available as buttons on the main tool bar.

Command	Action
Replay	Start replaying a data file.
Reverse Replay	Play back a data file in reverse (2x to 7x).
Slow Replay	Reduce the playback speed. (/2 to /7)
Fast Replay	Increase the playback speed.
Fast Reverse Replay	Increase the reverse playback speed (2x to 7x).
Slow Reverse Replay	Reduce the reverse playback speed. (/2 to /7)
Start Live Mode	Start displaying data. Data is not logged.
Start Logging	Initiates a data recording.
Pause	Pause data collection or replay.
Stop	Stop data collection or replaying a data file.
Single Step Mode	Pauses replay until Single Step is selected
Single Step	Enables user to step through the database in playback mode when Single Step Mode is activated

Note: All parameters enabled on the mobile or receiver at system setup will be recorded during logging, not only those selected for display.

A summary of additional record and playback features is listed below:

- Pause/resume
- Survey markers and user notes -- Survey markers and user notes can be entered on the route map during a data collection test.
- Automatically numbered survey markers -- When enabled, the software automatically adds the following markers when logging:
  - 11 Start of Test
  - 12 Start of Data Collection
  - 13 End of Data Collection
  - 14 End of Test
  - 15 Pause
  - 16 Resume
- Playback of a database does not require a license key

## Data export

A number of commercially available post-processing tools can directly read the E6474A SD5 database file. Data can also be exported to comma or TAB delimited ASCII text files. The export function provides flexible filtering and binning capability that defines the specific data to be exported and with what lat/long, datum and time formats, including:

### Position formats

- Signed decimal degrees
- Decimal degrees with direction
- Deg: min: sec with direction
- Signed deg: min: sec
- UTM

### GPS datums at export

The following GPS datums are available for use when exporting the data:

- |                                  |                                |
|----------------------------------|--------------------------------|
| • WGS 84 (World Geodetic System) | OS36 (GB)                      |
| • AGD 86                         | SAD 69 (Brazil)                |
| • AGD 84                         | SAD 69 (Mean)                  |
| • European                       | Tokyo (J6)                     |
| • Hu-Tzu-Shan                    | Tokyo-Korea                    |
| • NAD 27 (North American)        | WGS 72 (World Geodetic System) |
| • NAD 83 (North American)        | Ireland 1966                   |

## Parameter link editor

This feature allows phone and receiver parameters to be linked to allow common measurement criteria to be tracked on the display.

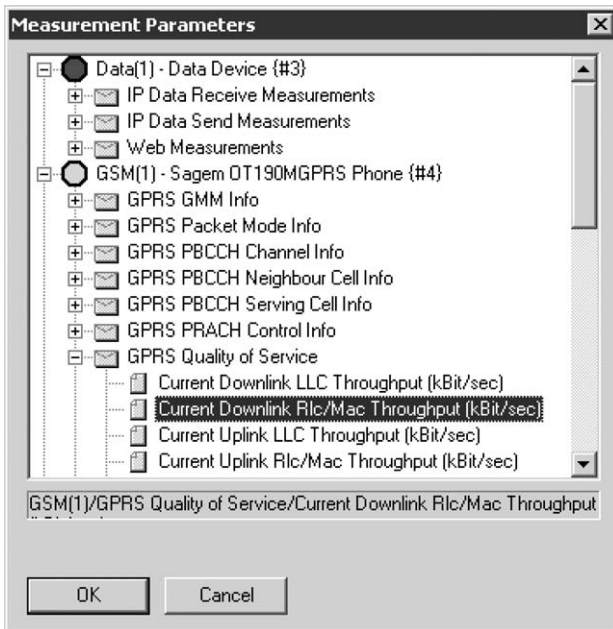
Examples:

- Link a phone's carrier channel to its adjacent channels, provided by the scanner/receiver. The carrier and adjacent channel signal are displayed graphically in the Adjacent Channels view.  
Note: You can link up to 10 phones with their adjacent channels.
- Link scanner/receiver channel measurements to phone channels/bands.
- Link CDMA scanner/receiver PN measurements to the phone's PN increment.
- Link PN scanner measurements to GPS lock conditions.
- Link phone neighbor lists to scanner/receiver inputs.

## Measurement Parameters view

The Measurement Parameter view is an Explorer-style view of the system devices and their measurement parameters. When a data stream is required for entry into a dialog box, the Measurement Parameters view opens, enabling the user to select a parameter and automatically generate the data stream required.

The Measurement Parameters view is initiated by the Alarms view, Time Chart view and Route Map view, as described in the following three sections:



## Custom View

Custom view gives the user flexibility to create customized views by selecting parameters required and displaying them in a tabular format. Up to 40 parameters can be applied per view and multiple views can be created and saved for reuse.

## Alarms view

The Alarms view is used to configure alarms that are triggered by parameters received during a test that meet user-defined criteria. Parameters collected as integer values or messages, from connected phones, receivers or GPS navigation hardware, can be used to initiate alarms; these parameters are selected using the Measurement Parameter view. The user can choose any one or all of the following actions to occur on an alarm:

- A .WAV audio file can play
- A marker can be written to the database file, and displayed in the Route Map and Time Chart views
- A pop-up message box can be displayed
- Measurements can be paused or stopped

Each alarm event is also tabulated on the Alarms view as it occurs. Fifty pictorial survey markers are available to depict alarm events within the Chart and Route Map views. Alarms require set-up prior to a database collection in order to enable survey markers during playback.

The Alarms view enables the user to create simple or complex conditions to trigger an alarm. The following are examples of how an alarm can be generated:

- Monitor a single parameter for a single set of criteria. When the criteria are met, an alarm is generated.
- Monitor a single parameter and logically "AND" up to five sets of criteria. When all sets of criteria are met, an alarm is generated.
- Monitor several parameters, each with a single set of criteria. Each parameter can generate its own sound when the criteria are met.
- Monitor several parameters, each with multiple logically "ANDed" sets of criteria.



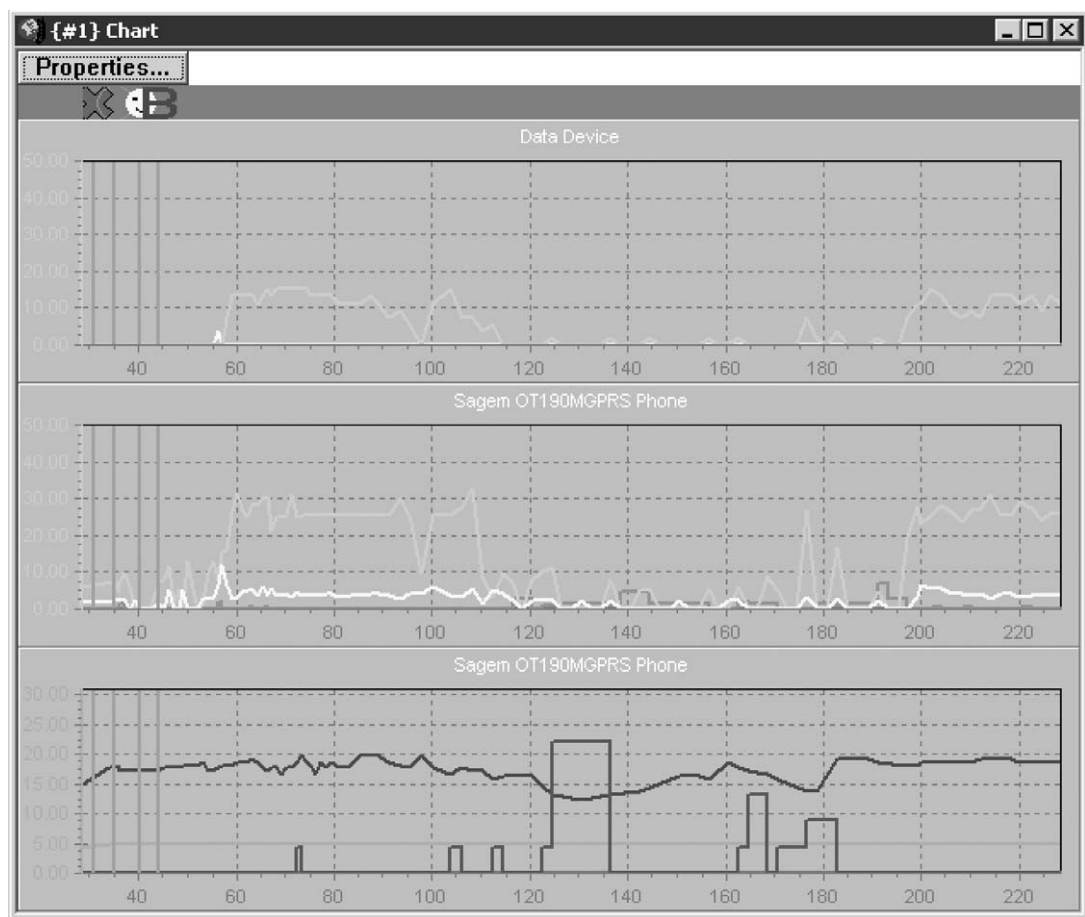
Each parameter can generate its own sound when the criteria are met.

- Monitor a parameter that is collected as a text message and generate an alarm when the message changes.
- Configure multiple instances of the Alarms view. Use one for each device.

Alarm configurations can be shared using export and import commands from the Alarms view. These alarm configurations are stored as .MSF files. The E6474A software is supplied with over one hundred predefined .MSF files. By default these are stored at C:\Program Files\Agilent Technologies\Shared\Alarms.

## Chart view

The Chart view is used to display measurements using a graphical display. Once configured the user can see measurement information displayed relative to time, in both live and playback modes of operation. Up to 24 user-selected measurements can be displayed simultaneously, as four groups of six parameters. Multiple chart views can be displayed.



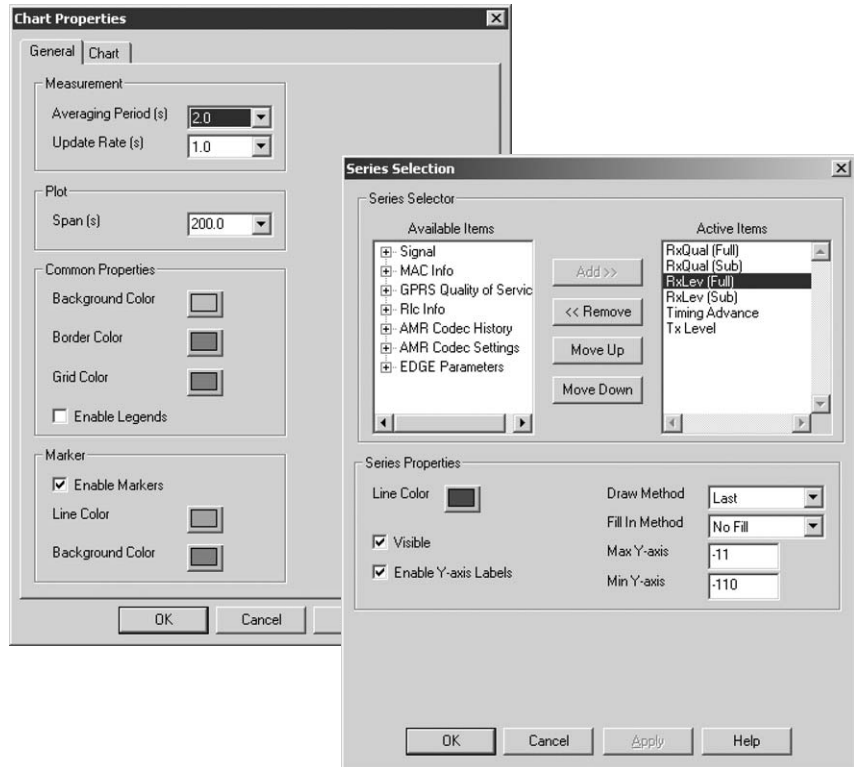
The user-configurable options are initiated in the Chart view Properties dialog box. General Chart Properties enable selection of:

Measurement averaging period, measurement update rate, x-axis (time) span, display/hide markers, display/hide legends and background, border and grid colors.

Specific Chart Properties enable selection of:

Device and measurement series, y-axis max and min per measurement, chart display

on/off, y-axis scale display on/off, Draw method, Fill In Method and plot line colors.



## Route Map view

The Route Map view shows current position and the route traveled on a map as data is collected. Several layers of information can be displayed, including signal parameters (selected via the Measurement Parameter view), survey markers, and notes. Basestation locations, with site names and sector orientations, can also be plotted on the map when linked to the appropriate cellsite naming database.

There are two types of route maps

- The Route Map, used with a GPS navigator - included with the E6474A platform
- The Indoor Route Map, used without a GPS navigator - supported by E6474A-030 (indoor measurement software license).

The following route map features can be switched on or off: Channel List, Zoom Buttons, Current Position Buttons, Layer Buttons, Indoor Navigation, Map Scale, Compass, Status Bar, Button Bar, and Color Scheme.

## Layer Menu

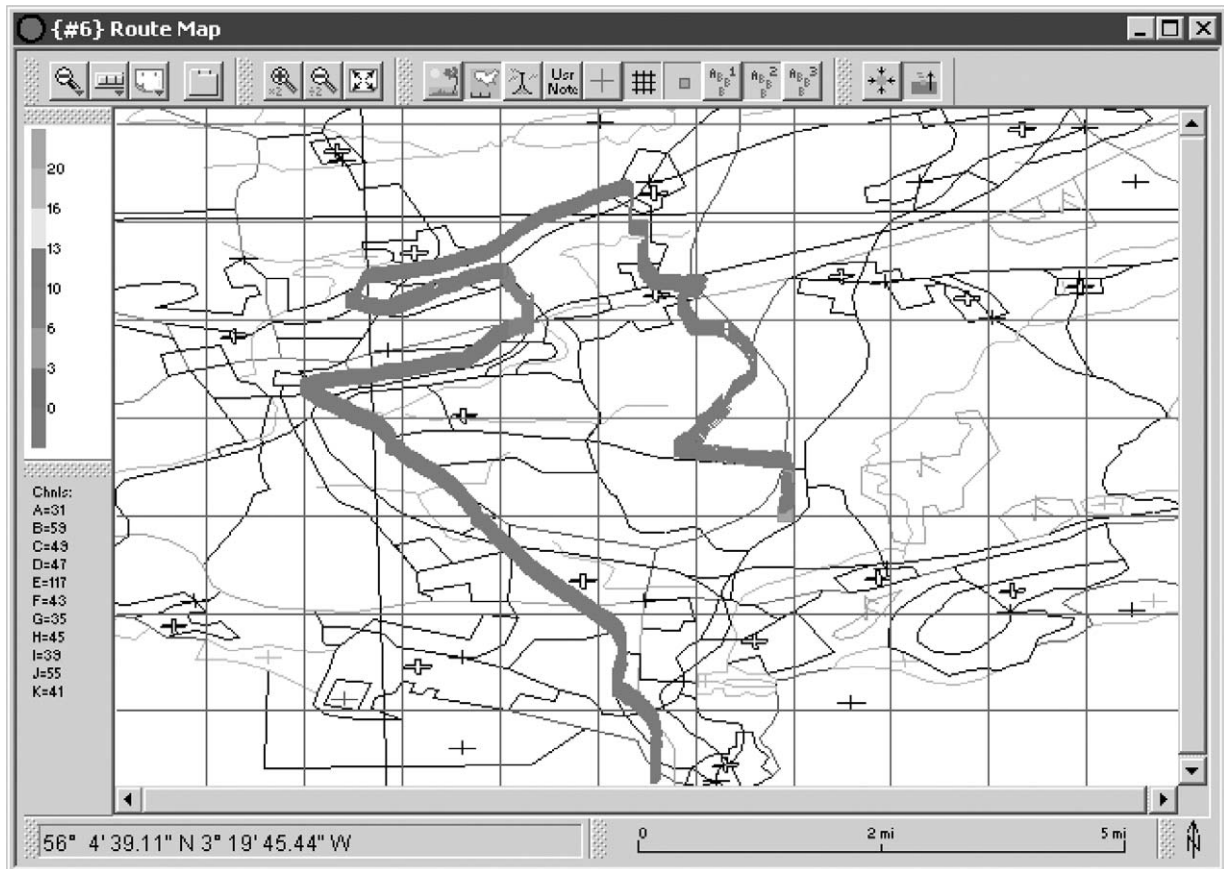
The following layers are supported by the route map view, the properties of these layers are accessed by right-clicking the associated button:

- Cellsite - This shows the name and properties associated with the cell. A cellsite database must be selected to show this layer.
- Map Picture Layer - This shows the selected .bmp map.
- Street Map Layer - This shows the selected .map or .mif map. Note that TAB files are also supported through conversion to .mif format
- User Notes - This shows notes that have been entered.

- Survey Markers - This shows Survey Markers that have been entered.
- Current Position - This shows current lat/long position.
- Signal - This shows the color code related to the 'signal strength' attribute and the letter associated with the 'channel' attribute as set-up via the Measurement Parameter view in signal properties. The number of signal buttons available depends on the technology of the tracking phone, to a maximum of three.

### Route Map Properties

This dialog box enables the user to configure a number of route map properties, such as the units of measure (U.S. or metric), the distance represented by one pixel, the background color, and the border characteristics of the Route Map view.



## Additional options

This section is designed to give a brief overview of relevant additional options. Please refer to the E6474A Wireless Network Optimization Platform configuration guide, literature number 5988-2396EN, for comprehensive configuration details.

### Software

#### **Data measurement software license, E6474A-700**

This data measurement capability utilizes a client / server architecture, where the client is the test mobile and laptop combination and the server is a remote computer connected to an IP interface within the network. The data control and measurement user interface resides on the client laptop. The Agilent E6474A system is designed to allow a single server to support several clients. The data measurement sequence controller allows the user to construct flexible transmit and receive data geometries with programmable delays for both UDP and TCP mechanisms. Ping, Trace Route and multiple FTP and http transactions can also be included in the sequence.

Data measurement functionality on both transmit and receive paths (e.g., application throughput, IP throughput, IP bit error rate, data fragmentation and delay) will only be supported with the purchase of both E6474A-700 and -710. E6474A-700 can be used without the Agilent server software E6474A-710. This will enable the sequencing of access to public ftp and http sites enabling the measurement of total bytes downloaded, time to download, and data throughput at the application layer.

#### **Data measurement server software license, E6474A-710**

The server is the target for the above data measurement option (E6474A-700). It calculates transmit path measurement results, as detailed above, and transmits them together with the requested data pages back to the mobile client for analysis and characterization. E6474A-710 requires the purchase of at least one data measurement software license (E6474A-700) and will support several option 700s. The E6474A-710 software resides on the server and, once installed, can operate unmanned.

For detailed information on the data measurement capabilities, refer to the Agilent Wireless Data Measurement product overview, literature number 5980-2310E and the Agilent Wireless Data Measurement data sheet, literature number 5988-1507EN.

#### **The Wireless Application Measurement Software (WAMS) license, (E6474A-740)**

WAMS enables wireless data services testing on, for example, MMS, SMS, email, WAP, http, voice connectivity, video connectivity and FTP applications. This option provides an extremely flexible test sequencer engine and user experience measurements that include TCP throughput, Server Response Time, Authentication Time and Data Download Time on the real data applications. These measurements provide verification of the wireless data delivery chain, giving quick identification of data network problem areas and highlighting whether they are for example RF, backhaul or Internet service provider related.

For further detail refer to the Agilent Data Service Assurance (DSA) Product Overview (5989-0469EN) and the Wireless Application Measurement Software Data Sheet (5989-0470EN).

### **Multiple phone control, E6474A-010**

The Agilent E6474A-010, in addition to either the phone measurement license or the phone and receiver combination license, extends the system to support up to four test mobile phones simultaneously. Use of multiple phones can significantly improve optimization efficiency. Some applications of multiple phone configurations include:

- Simultaneously evaluate performance on multiple frequencies
- Execute origination, termination, and dropped call testing simultaneously
- Execute measurements on your network and competitive networks simultaneously

### **Indoor measurement software license, option 030**

Agilent E6474A-030 enables the system to operate using a touch tablet PC, without GPS, to make phone and receiver-based GSM wireless measurements inside of buildings. While walking through a building, waypoints are recorded on a floor plan of the building. Measurements are interpolated between waypoints. Indoor measurements require a BMP format floor plan or sketch of the building to be measured. An essential part of the indoor measurement system is a pen tablet computer, which allows the user to correlate measurements with positions on a floor plan. Refer to the E6474A Wireless Network Optimization Platform configuration guide, literature number 5988-2396EN.

Indoor measurement features

- Autoscale
- Autopan
- Auto legend
- Ability to link phone or receiver measurements to plot
- Waypoints with interpolation
- Moveable waypoints

### **Analysis Reporter**

The Analysis Reporter option is a simple-to-use report tool, which is integral to the E6474A platform. It works on automatically generated export files, using both phone and receiver data, and can quickly generate comprehensive network performance overview and detailed network analysis reports and histograms including, for example, performance summary reports, call quality analysis reports, details on performance per call, neighbor and handover summary and drill-down, aggregate Ec/Io vs RxPower and many more. Analysis Reporter currently supports GSM, GPRS, cdma2000, UMTS and data measurements on a single E6474A-758 product option.

### **Actix DV for Agilent**

Agilent Technologies offers the Actix DV dedicated post-processing solution for product numbers E5641A-400 (cdmaOne, cdma2000), E5641A-500 (cdmaOne, cdma2000, 1xEV-DO). This tool is designed to enable network engineers to visualize and troubleshoot network problems with maximum effectiveness. Features such as 'event navigator', view synchronization, protocol stack browsing and drill-down, and chart and map visualisation enable specific events to be diagnosed in detail, whilst a range of standardized reports represent measurement summaries. For further information please refer to Actix DV for Agilent Overview (5988-9147EN).

# Hardware

## Outdoor GPS navigation support

The Agilent E645xC range of receivers include GPS navigation capability. The Agilent Direct Connect GPS, with dead reckoning is also available as E6473B-030 (with mag mount antenna) and E6473B-031 (with permanent mount antenna) options.

The E6474A Optimization platform supports TAIP, TSIP and NMEA compatible third party GPS receivers including Trimble Placer GPS 455 receiver with dead reckoning and Garmin II.

The key features of the Agilent supplied GPS receivers are tabulated below:

<b>E645xC receivers</b>	<b>Agilent E6473B-030 and -031</b>
<ul style="list-style-type: none"><li>• 8 channel GPS receiver</li><li>• Mounted inside Agilent RF receiver enclosure</li><li>• SMA antenna connector</li><li>• Bulkhead mount antenna with cable</li><li>• Magnetic mount antenna with cable</li><li>• Differential compatible</li><li>• Not dead reckoning compatible</li></ul>	<ul style="list-style-type: none"><li>• 12 Channel GPS receiver</li><li>• Dead reckoning</li><li>• Heading sensor</li><li>• Interconnect cables to Direct Connect hub interface</li><li>• Magnetic or permanent mount antenna option</li></ul>

Note: With the Agilent E645xC receivers, an external GPS source may be used with the receiver even though an internal GPS exists within the receiver housing. This is valuable when differential or dead reckoning measurements may be needed. Only one GPS source can be used at any given time.

## Test mobile phone hardware

The E6474A system software can control up to four test mobile phones. If more than one test mobile phone needs to be controlled simultaneously, it is necessary to have the E6474A-010 multiple phone software license.

## **Agilent high speed direct connect hub kits E6473B options 015 and 021 to 024**

Agilent offers a high speed direct connect hub (E6473B-015) and associated in-vehicle kit (E6473B-021), and portable kits (E6473B-022, -023 and -024) for use with the E6474A system. The Agilent high speed direct connect hub consolidates PC communication cabling and provides charging/powering for up to two phones and two receivers/one scanner. The phone ports are dual serial ports and can handle both trace and data. The maximum achievable data rate from the serial ports is 460 kbps. The Agilent high speed direct connect hub also provides three downlink USB ports. Multiple hubs can be cascaded via the USB connections.

Phone specific cables are required for use with the Agilent high speed direct connect hub.

## Computer hardware requirements

The Agilent E6474A system requires a PC. The PC requirements differ depending on the hardware configuration and on which parameters are being selected. Administrator rights are required.

### **Recommended minimum PC specifications:**

- Windows® 2000 or XP Professional Service Pack 2 onwards (inc XP for Tablet PC)
- 600MHz PIII, 256MB RAM
- RS-232 DB9 serial port
- 2 USB ports (for software key and device connection)
- PCMCIA slot or a connection (for multiple hardware support)
- 10 GB hard disk
- CD-ROM drive recommended for installation
- 1024 x 768 display resolution minimum



## Warranty

One-year warranty on hardware components and one year of application support is included with a purchase of an Agilent E6474A drive test system. Extended warranty may be purchased through options W3x and W5x. Extended warranty cannot be purchased for supplied mobile phones from Agilent.

## Support options

For the E6474A software licenses the following support options are included for the first year:

- Agilent Call Center phone support, four hour response time or less
- Telephone assistance and web training on specific topics
- Software updates

On-site training and start-up assistance is not included with the E6474A options, it is orderable separately as H7211B-209. WAMS training is also available under H7211B-232 and H7211B-233.

The Agilent Advantage Integrated Customer Care Program allows customers to upgrade to more comprehensive product support options. For the program summary and options, refer to literature number 5988-4793EN.

## **Additional Agilent literature**

### **Product Overviews**

Agilent E6474A Wireless Network Optimization Platform Product Overview	5988-3558EN
Agilent Indoor Wireless Measurement Systems Product Overview	5968-8691E
Agilent Wireless Data Measurement	5980-2310E
Agilent Direct Connect Hub	5988-3176EN
DSA Product Overview	5989-0469EN

### **Data Sheets**

Agilent E6474A Wireless Network Optimization Platform for GSM and GPRS	5988-5904EN
Agilent E6474A Wireless Network Optimization Platform for UMTS	5988-8519EN
Agilent Wireless Data Measurement Wireless Application Measurement Software	5988-1507EN
E6474A Wireless Network Optimization Platform Configuration Guide	5989-0470EN
	5988-2396EN

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